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ABSTRACT

In this middle school mathematics unit two imaginary characters, Horatio and Portia, decide to make their fortune in Quincy Market (Boston, Massachusetts) running a Bull Market cart. In order to solve the problems that they encounter, they need to learn ratio and proportion, map reading, estimation, area and perimeter, population sampling, problem solving, and the collecting and processing of data. Teacher notes at the beginning of each section indicate the math objectives, materials, and whether the activity is a reinforcement or an extension of a math skill. The unit is divided into seven modules that can be used either independently or sequentially. These are: (1) an introduction to Quincy Market; (2) the use of the ruler; (3) map exploration; (4) ratio and proportion; (5) scale drawing; (6) perimeter and area; and (7) a simulation (in which the students run their business using the Bull Market Game or a computer simulation). Each module consists of two or three class activities and additional activities which can be used as extensions. The unit contains student worksheets, teacher notes, transparency masters, Bull Market Game cards, and a diskette to be used with the computer portion of the "simulation" module. (TW)

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QUINCY MARKET

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THE REGIONAL MATH NETWORK

A Teacher Invigoration and Curriculum Development Project

sponsored by the

National Science Foundation

and

Harvard Graduate School of Education

SE 048 379

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FOREWORD

Mathematics is an increasingly important skill for understanding and appreciating the challenges in our society. Yet the learning of these concepts poses difficulties for many students, especially as they reach the junior high/middle school years. At the same time, mathematics teachers are leaving their profession at a rapid rate, tired of using materials that have not been revised to reflect changes in our society and its workforce. Clearly, a need exists to revitalize both the self-esteem and the teaching resources of those who have chosen this profession. The **Regional Math Network** aims to address these difficulties. The project, **funded by the National Science Foundation**, is sponsored by the Harvard Graduate School of Education.

The overall goal of the Regional Math Network is to invigorate individual teachers and to enhance the quality of the materials and techniques of those in the mathematics teaching profession. To achieve this goal, the Regional Math Network provided 22 Teacher Fellows from eleven school systems with a structured opportunity to collaborate with local business professionals and university personnel in the development of innovative teaching materials and instructional strategies. The school systems represented in the project include Acton, the Archdiocese of Boston, Boston, Cambridge, Chelmsford, Hingham, Lexington, Somerville, Waltham, and the Carroll, the Tower, and the Buckingham, Brown & Nichols Schools.

The **Regional Math Network** also seeks to stimulate math teaching in the greater Boston area. Toward that end, the Network sponsors seminars, receptions and meetings for math teachers and other interested professionals and students. The **Regional Math Network** serves as a model of collaboration on several levels: among different schools in the region, between schools and local businesses, and between these parties and the University, which primarily serves as a facilitator and resource.

A fundamental objective is to produce supplemental materials that are engaging for early adolescents and to improve their interest and ability in problem solving. The Teacher Fellows were organized into four project teams, each with a team leader and graduate research assistants. After conducting a needs and interest assessment within many regional schools and districts, each project team selected a specific context that provided the basis for the consideration of a major mathematical topic traditionally covered in the middle school curriculum. These contexts include an ice cream factory, local sporting events, the solar and space shuttle systems and Quincy Market, a local tourist and commercial area. To better understand the context, teams conferred with members of the local business community and worked with students from Harvard's MidCareer Math & Science Program, former business professionals studying to become mathematics teachers.

Each of these four context areas is linked to specific mathematical topics. While this emphasis does not exclude other related topics, teachers seeking materials on a particular topic may choose to work with a specific unit. The topics of emphasis include:

Ice Cream - Fractions
Math/Space Mission - Estimation, Geometry and Relational Concepts
Quincy Market - Ratio and Proportion
Sports Shorts - Decimals and Percents

All four of the units include a common emphasis on problem posing and problem solving. Many of the activities are open ended, encouraging students to pose their own problems for solving. Other themes and topics common to all of the units stress skills of estimation, graphing, polling, reading and interpreting charts, calculators and computer application and mental arithmetic. All of the materials stress realistic, mathematical applications that are accessible and motivating to middle school students.

Each of the units contains a variety of teacher and student resources. These include teacher notes and teaching suggestions, student pages, answers, activity cards, transparency masters, manipulative materials and classroom games. Additionally, the Quincy Market unit contains a computer disk suitable for any Apple computer.

These materials were written by teachers for other teachers to use. Hence, the materials and format are designed with a teacher's needs and constraints in mind. Comments about these materials are welcomed and may be made by writing to Professor Katherine K. Merseth, The Regional Math Network, Harvard Graduate School of Education, Cambridge, MA 02138.

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HORATIO AND PORTIA

A Mathematical Adventure

Introduction

Welcome to the world of Horatio and Portia, two imaginary characters who hear about Quincy Market and decide to make their fortune running a Bull Market cart. They have all sorts of adventures and mis-adventures in the process as they use maps to find out how to get to Quincy Market, take surveys to determine what to sell, and finally, run their cart.

Horatio and Portia constantly need math skills to solve their problems. They learn ratio and proportion, map reading, estimation, area and perimeter, population sampling, problem solving, and the collecting and processing of data.

Students who have used this unit in its pilot form have found it both fun and challenging, and we expect that your students will, too. They will use math because they need it to solve interesting and real problems that spark their imagination.

To make this unit easy to use by teachers who have many demands on their time, we have provided a variety of already prepared or easy to prepare materials. The Teacher Notes at the beginning of each section indicate the math objectives, materials needed, and whether the activity is a reinforcement or extension of a math skill.

We have divided the unit into seven modules. Each can be used independently, but the story line and the mathematical ideas flow best when they are used sequentially. The modules are:

1. Introduction to Quincy Market
2. Ruler
3. Map Exploration
4. Ratio and Proportion
5. Scale Drawing
6. Perimeter and Area
7. Simulation

Each module consists of 2-3 class activities and additional activities which can be used to reinforce or extend the topics presented in class. Every effort has been made to present material in a variety of ways and on a variety of levels. You will find individual, group and class activities. Material is presented concretely, visually, verbally, and numerically.

Teachers who have access to a computer for class use will find that the unit provides excellent opportunities for introducing students to real-life computer applications. The data which Horatio and Portia gather can be organized using a data base. In addition, their cart's inventory and financial reports are perfect for spreadsheet applications. We have included a computer game developed for this project, *T-Stop Sales*, which simulates the Bull Market cart business. The program will run on any Apple II computer.

OVERVIEW OF THE UNITS

Introduction to Quincy Market: This unit, which introduces the student to Quincy Market, provides a variety of alternatives to the teacher. A field trip (guidelines included), or a poster of Quincy Market which can be colored and displayed to stimulate class discussion can "set the scene".

Students are introduced to Horatio and Portia, who have just found a flyer announcing a sales opportunity at Quincy Market. Students read and study the flyer and accompanying scale drawings to glean facts about the market and to make decisions about potential sales opportunities.

Ruler: Students construct their own rulers and then use Quincy Market Bull Cart information to solve puzzles which require careful measurements. A map of a section of downtown Boston is also included which requires measurement and problem solving.

Map Exploration: Students use maps to explore metropolitan Boston. Students locate their own communities, Quincy Market, and other points of interest. They study scale coordinates, linear measurement, and distance within a circle of specific radius as they discover a wide variety of information about Eastern Massachusetts. The state map extends their map reading skills and knowledge of routes, distances and scale.

Ratio and Proportion: Horatio and Portia have to make important decisions about what to sell, how much to charge, and where to locate their cart. Students help Horatio and Portia to make predicitions using actual figures from Quincy Market shops. They take their own survey to determine what they would sell. Teachers with access to a computer may have students record and analyze their information using a data base.

This unit incorporates many mathematical objectives including generating data from text and maps, population sampling, ratio, proportion, survey techniques, data collection and analysis, and problem solving.

Scale Drawing: Students use the scale drawing of Quincy Market to construct a classroom display. They then construct three dimensional models of the Bull Market carts and enlarge pictures of a crow and a grasshopper to include in the display.

In this unit, the students are using their knowledge of ratio and proportion, linear measure, scale drawing, and area and perimeter to solve real problems. Since this is a class project, students must depend upon one another for accuracy.

Perimeter and Area: Horatio and Portia need to know about perimeter and area to solve some of their problems. They develop an intuitive understanding of these topics as they explore Quincy Market. For example, they discover how many carts it would take to surround Quincy Market, how many people can fit into a small area, and project these answers onto larger areas.

In this unit students will use their knowledge of perimeter and area to make projections about Quincy Market.

Simulation: Students finally run their cart!! We have provided two methods of achieving this. In the "Bull Market Game", the class (or small groups) compete to make the greatest profit at the end of the week. The teacher who has access to one or more Apple computers can use the program specifically designed for this unit, "T-Stop Sales". In this program, students try to beat Sloppy Joe, a lazy business person who also runs a tee shirt cart. They can beat him only if they order carefully and price wisely. Both options require problem solving strategies and provide a review of basic math skills.

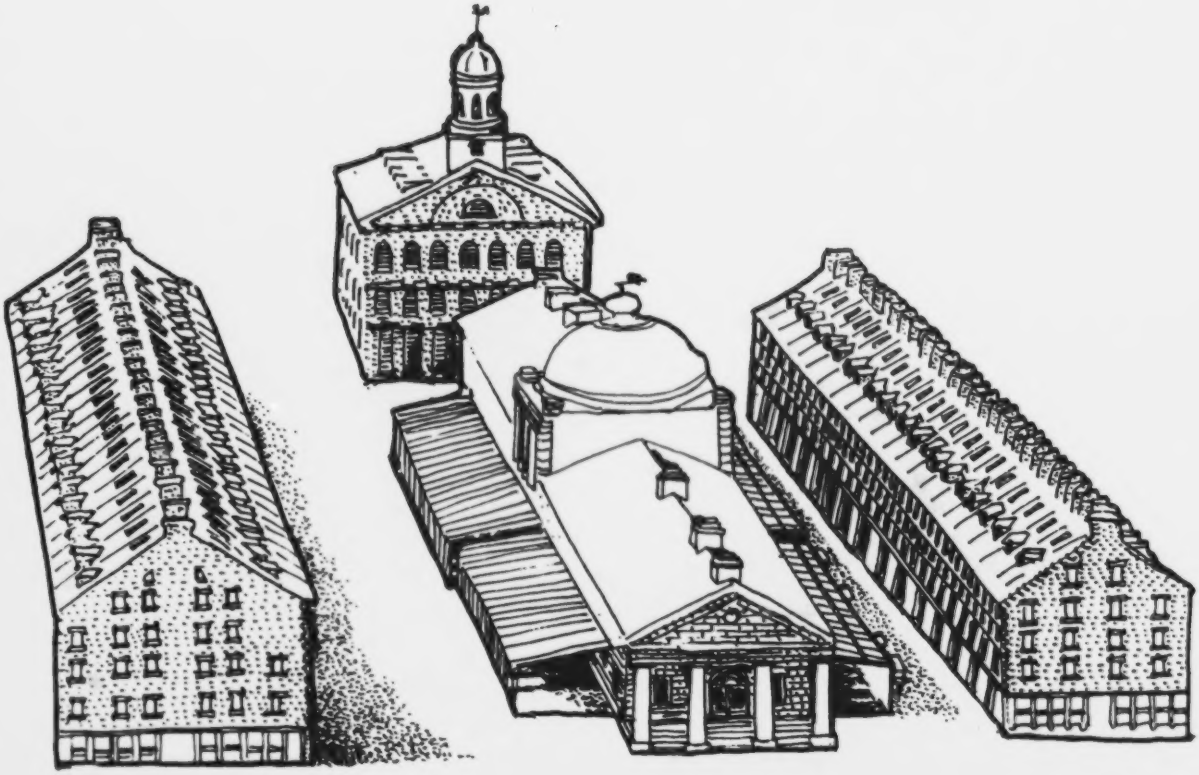
Students also learn to keep business records either by hand or using a computer spreadsheet application. They complete the project by finishing Portia and Horatio's Story.

ACTIVITY GRID & CONTENTS

		Ratio & Proportion				Perimeter & Area Measurement						Additional Topics										Activity Coding					
	Page Number	Meaning of Ratios	Solving Proportions	Rate Problems	Scales	Measuring Skills	Perimeter	Area	Naming Figures	Circle Concepts	Converting Units	Interdisciplinary	Mental Arithmetic	Estimation	Graphing	Understanding Charts	Prediction	Geometry	Reading Maps and Scale Drawings	Problem Solving	Collecting and Analyzing Data	Problem Posing	Introductory	Long Term	Open-Ended	Answers Provided	Calculator / Computer	Special Challenges
Intro																											
Getting the Facts	9											●								●	●		●					
QM Field Trip	11											●									●		●					
Ruler																											
Follow the Ruler	19					●								●		●									●			
Code to Portia	23					●																			●			
Where's My Cart?	24					●								●						●					●			
Take the Bull by the Horns	28															●				●		●		●				
Line Up	30					●																						
As the Grasshopper Hops	32					●													●	●					●			
Map Exploration																											
Map Exploration	38				●	●								●		●			●	●	●							
Partial Map of Boston	39																		●		●	●		●				
Boston + Vicinity	40		●		●	●				●	●			●					●	●	●							
Route from Boston	43																		●	●					●			
Where does the Crow Land?	44				●	●					●		●	●					●	●		●			●			
Ratio and Proportion																											
Your Ratios	51	●														●												
Portia Predicts	53	●	●	●							●									●	●	●			●			
One of the Crowd	55	●	●														●			●					●			
Crowd According to Portia	57	●	●										●	●			●			●					●	●	●	●
Survey Introduction	58	●	●											●		●			●		●							
Create a Bar Graph	64														●	●				●	●							
Tally - Ho	67														●					●	●							
Steve's Ice Cream Survey	69		●	●						●			●				●			●						●	●	

ACTIVITY GRID & CONTENTS

		Ratio & Proportion					Perimeter & Area Measurement						Additional Topics										Activity Coding					
	Page Number	Meaning of Ratios	Solving Proportions	Rate Problems	Scales		Measuring Skills	Perimeter	Area	Naming Figures	Circle Concepts	Converting Units	Interdisciplinary	Mental Arithmetic	Estimation	Graphing	Understanding Charts	Prediction	Geometry	Reading Maps and Scale Drawings	Problem Solving	Collecting and Analyzing Data	Problem Posing	Introductory	Long Term	Open-Ended	Answers Provided	Calculator / Computer	Special Challenges
Scale Drawing																												
Scale Drawing of Shops	72				●		●	●	●	●	●	●			●	●	●		●	●	●					●			
Graph Hopper	85	●	●		●		●		●			●				●			●	●	●					●			
Construct Bull Cart	87		●		●		●	●	●		●	●																	
Perimeter and Area																												
Perimeter	91						●	●		●									●		●								
I Counted My Hops	92		●				●	●											●		●	●				●			
Hands Around School	93						●	●		●					●			●	●		●								
QM We've Got You Surrounded	94						●	●						●	●			●	●		●					●			
Portia's Dilemma	95							●	●						●			●	●		●					●			
Area: Squares and Rectangles	96								●			●			●			●	●		●								
How Many Visitors Fit in QM?	97								●						●			●	●		●					●			
Bull Cart Storage	98								●						●			●	●		●								
Spot on the Wheel	99										●				●			●	●		●						●		
Pi for Horatio	102										●	●			●				●							●	●		
How Many Rotations?	103										●				●				●							●			
Big Slice in Life of Horatio	104										●				●				●										
Pizza Pi	106										●								●										
Room Under the Umbrella	107										●				●			●	●		●						●		
Summary																												
Business Simulation	112												●	●				●			●					●		●	
Grand Finale	116												●										●		●				



INTRODUCTION TO QUINCY MARKET

GETTING THE FACTS

Topic/Objective	Materials
Generate data from written materials and maps	Quincy Market "business opportunity" flyer, storyline poster,scale drawings of Quincy Market

Before Class:

Prepare a bulletin board
Select appropriate bulletin board materials from the following introductory pages
(Note: A large poster of Quincy Market is included in your packet)

Schedule a field trip (optional)

Make overheads of scale drawings and cast of characters

During Class:

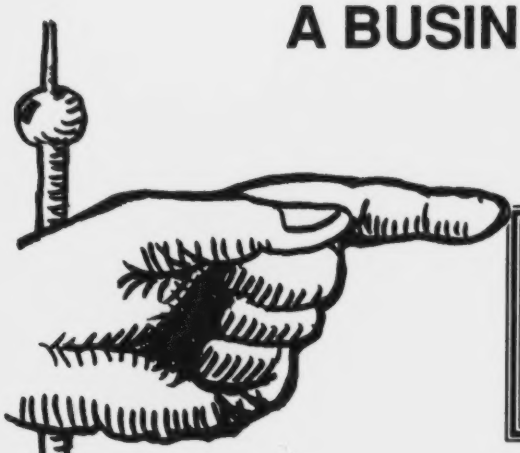
1. Introduce the history of Q.M. using "Hometown Boy Makes Good" information sheet.
2. Discuss the present day Q.M. using the scale drawings and "Move Over Mickey Mouse".
3. Introduce the cast of characters (Horatio, Portia, etc.).
(Note: These characters are essential to the story line in each unit.)

After Class

Ask students to write and solve five interesting math questions based on "Move Over Mickey Mouse."	Reinforcement
Make a poster illustrating an idea from "Hometown Boy Makes Good."	Reinforcement

Attention

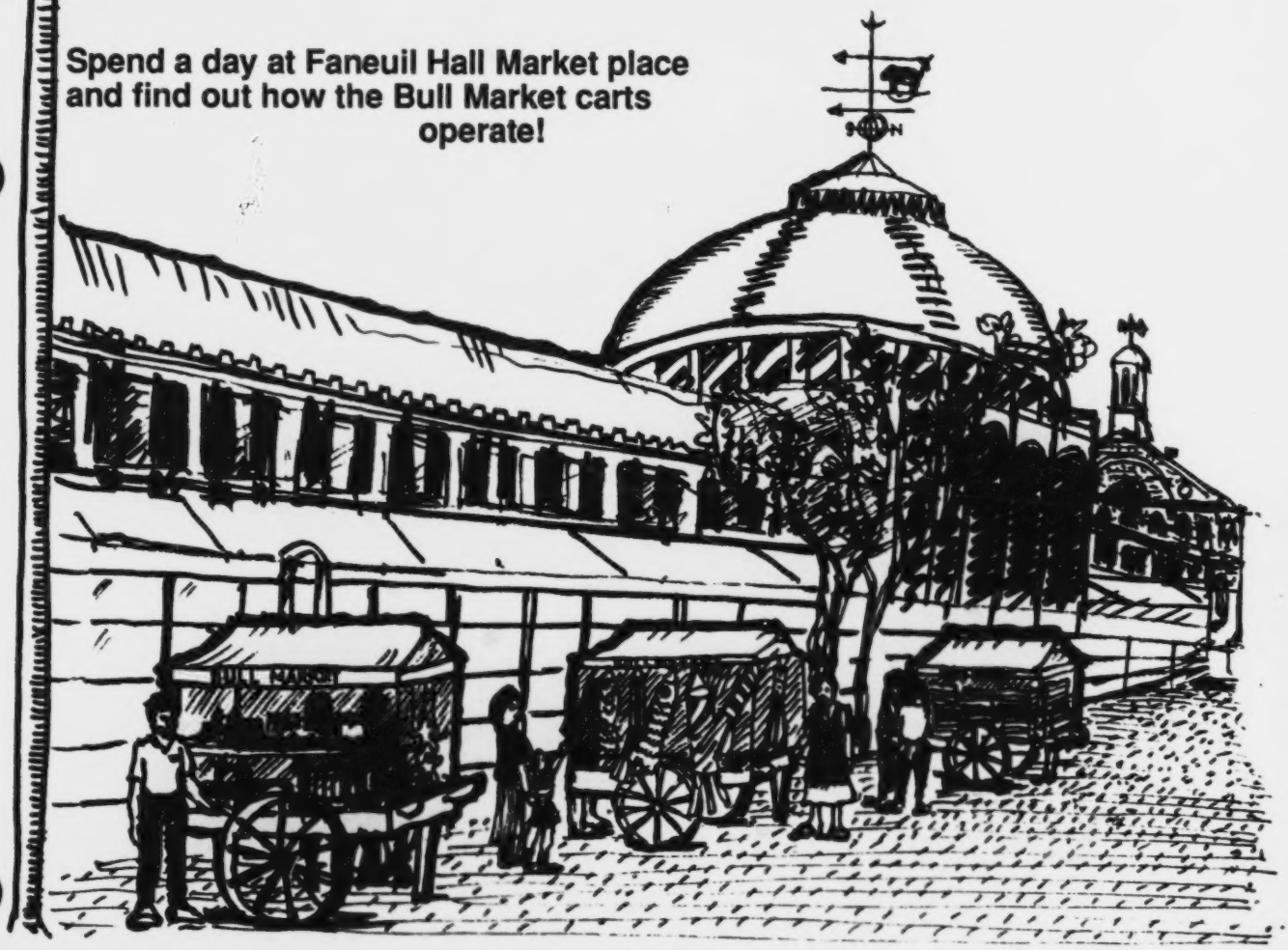
A BUSINESS OPPORTUNITY



RUN YOUR OWN BULL MARKET CART AT FANEUIL HALL MARKET PLACE

"FUN, FANTASY, FOOD, AND FROLIC"

Spend a day at Faneuil Hall Market place and find out how the Bull Market carts operate!



QUINCY MARKET FIELD TRIP

A field trip to Quincy Market provides an excellent introduction to this unit. Students not only have an opportunity to "sample the flavor" of Quincy Market, they also have an opportunity to expand their knowledge of Boston history through a trip to Faneuil Hall and to learn how to do some real "data collection" as they gather information about Quincy Market. A trip must be carefully planned, however, so that students gain maximum benefit from it. Some important information to help you plan your trip is included below:

Best time to visit: October to May (least crowded)

Transportation: Nearest T-Stop is Haymarket. Parking is very limited.

Cost: None, other than food and transportation

Restrooms: In basement of rotunda, very limited.

Guided Tours: None of Quincy Market, but the National Park Service provides guided tours of Faneuil Hall

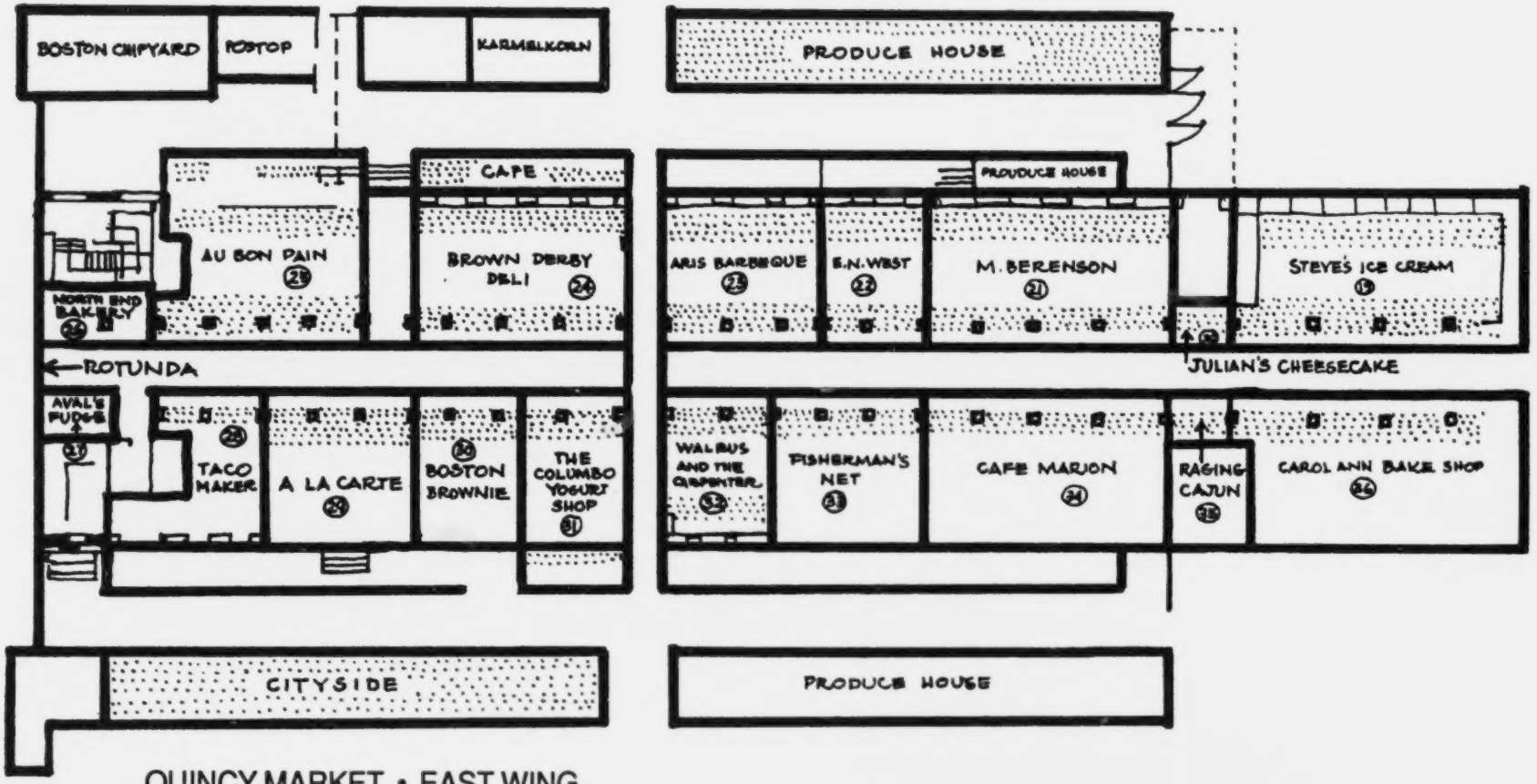
Chaperones: One for every 6 to 10 students if you plan to have students collect data

Pre-Field Trip Class Preparation:

- Discuss Quincy Market and Faneuil Hall:
  - Their history (brief outline in appendix)
  - Location (use the T-Aid map)
  - Layout of shops--difference between stall, Bull Market, and store (use diagram)
- Brainstorm about what students should look for:
  - Location and type of food stalls
  - Location and type of Bull Market carts
  - Location of grasshopper (weathervane on Faneuil Hall)
  - Location of bull (weathervane on Quincy Market)
  - Number of salespeople at each stand
  - How weather affects sales
  - How many geometric shapes can students find
  - Which is the best location for a Bull Market cart
  - Which is the most popular cart, food stall
  - How do carts store their supplies
- Assign specific tasks to each group:
  - Make a list of all the food stalls
  - Make a list of all the Bull Market carts
  - Count the number of pieces of pizza sold in 5 minutes (specify which 5 minutes and compare to another 5 minute period at a different time during the day)
  - Count the number of ice cream cones sold in 5 minutes
  - Count the number of people who enter the west door in 5 minutes
  - Estimate the dimensions of Quincy Market

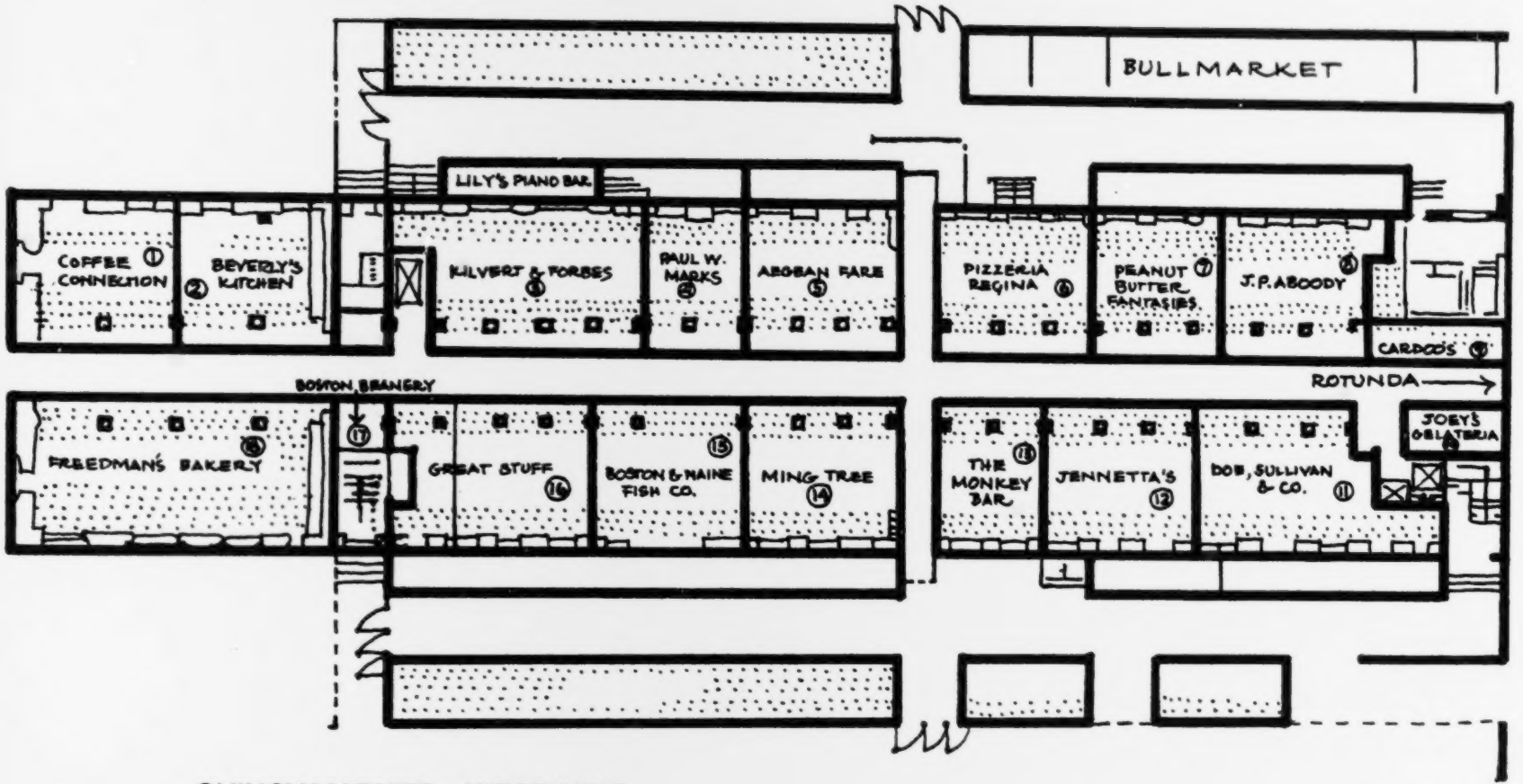
Follow-Up (homework, projects, etc.)

- Sketch a model of your favorite cart
- Draw a sketch of Quincy Market with the layout of stalls and carts from your notes
- Write an article on Quincy Market for your school or local newspaper



QUINCY MARKET • EAST WING

22



QUINCY MARKET • WEST WING

FANEUIL HALL MARKETPLACE

HOMETOWN BOY MAKES GOOD!

Faneuil Hall was a gift to the city of Boston by Peter Faneuil in 1742 to mark his success and repay his hometown by building a hall for public use.

FIRE DESTROYS FANEUIL HALL!

Faneuil Hall burned down in 1761 and was rebuilt in 1763 with public funds.

THE CRADLE OF LIBERTY!

Faneuil Hall became famous as a meeting place and popular "rostrum." The first rumblings of the American Revolution took place here. Faneuil Hall continues to be a popular, national "rostrum" (have you looked this word up yet?) for many popular and unpopular ideas, causes, and organizations.

-The Hall 'below' became a 'market' for the exchange of goods.

-The Hall 'above' became a 'market' for the exchange of ideas.

GROWING PAINS FOR FANEUIL HALL!

Architect Charles Bullfinch enlarges it in 1806.

A NEW NEXT DOOR NEIGHBOR!

The Quincy Market Building was constructed in 1823. It was designed by architect Alexander Parish.

QUINCY MARKET TAKES NOTHING FOR GRANITE!

The Quincy Market Building is a two story granite market house. It is flanked by two 'harmonious' granite warehouses, one on North Market Street and the other on South Market Street.

...BUT THE WALLS START TUMBLIN' DOWN!

The markets remained in continuous use but by 1950 needed much repair.

REPAIRS, RENEWAL AND REBIRTH!

Redevelopment began in 1973 and was completed in 1978.

MOVE OVER, MICKEY MOUSE

Did you know that 12 to 14 million people visit Quincy Market every year! That's more people than visit Disney World! Not only do these people visit Quincy Market--they spend money too!

$$$$$$$$$$$$

The average visitor spends $37, including $10 at the Bull Market Carts. The average Bull Market Cart shopper is between 10 and 20 years old. These visitors give an ambitious young businessperson an excellent opportunity to get started.

Who Visits Faneuil Hall Marketplace?

Here are some important figures:

18% work in Boston
18% live within Route 128
7% live in Massachusetts outside Route 128
57% live outside New England

What Do People Eat?

Here are some statistics: (approximate)

Pizzeria Regina sells 600 pizzas a day
The Taco Maker sells 400 tacos and 250 burritos a day
Boston Brownies sells 1000 brownies each day

Introducing.....

The Miscalculations of Horatio and Portia

THE CAST OF CHARACTERS

HORATIO

What's He Like?

A curious 13 year old--sometimes disorganized, sometimes illogical, sometimes impulsive, and sometimes.....

Favorite Expression:

"Oops! I miscalculated again!"

PORTIA

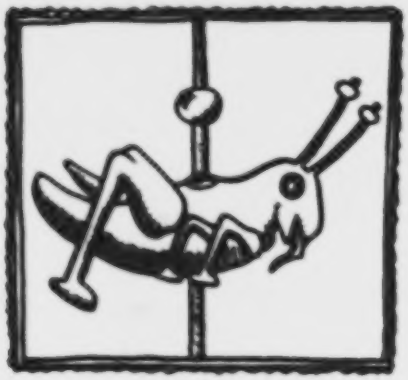
What's She Like?

A curious 13 year old-- sometimes organized, sometimes logical, often methodical, and often.....

Favorite Expression:

"It's perfectly obvious!"

THE GRASSHOPPER



What's He Like?

He's the symbol of Faneuil Hall Market place and sits high atop Faneuil Hall on the weathervane. He's always 'happy-go-lucky'.

Favorite Expression:

"I never measure! I just count my hops!"

THE CROW

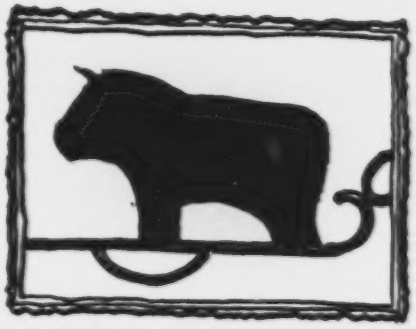
What's He Like ?

Very logical--all the time !

Favorite Expression:

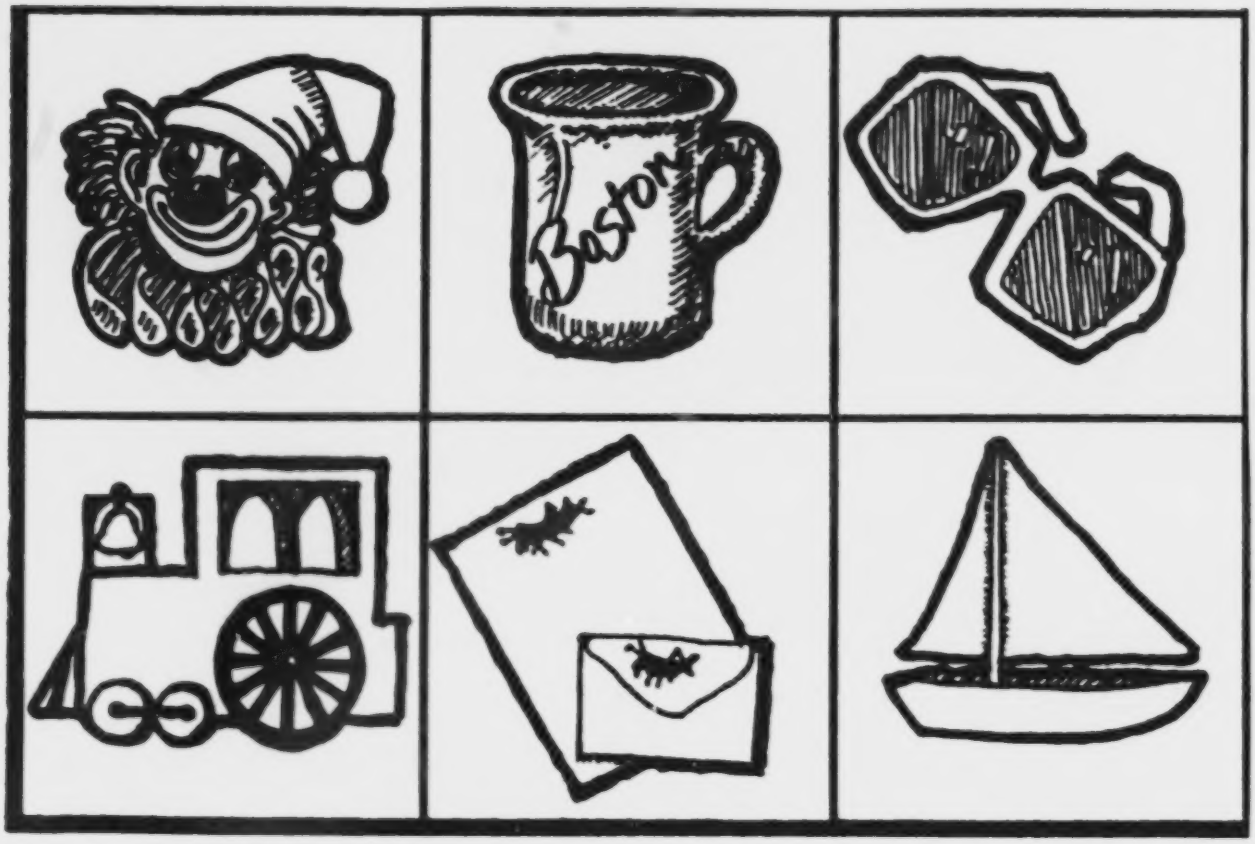
"The best way to get there is to fly in a straight line."

THE BULL



What's He Like?

He is the strong and proud symbol found atop the Quincy Market Building. He lends his name to the Bull Market pushcarts.



RULER

FOLLOW THE RULER

Topic/Objective	Materials
Reading a Ruler Estimation Skills	Rulers Tape measure (optional)

During Class:

1. Using "Portia's Complaint" do the following: (overhead may be used to verify answers)
   a. Introduce the ruler and discuss the divisions of an inch into 1/2, 1/4,1/8, 1/16 inch segments.
   b. Compare the divisions of an inch on the different rulers.
   c. Ask students to mark various measurements on the rulers (e.g., find 2 1/2 and place an "A" there)

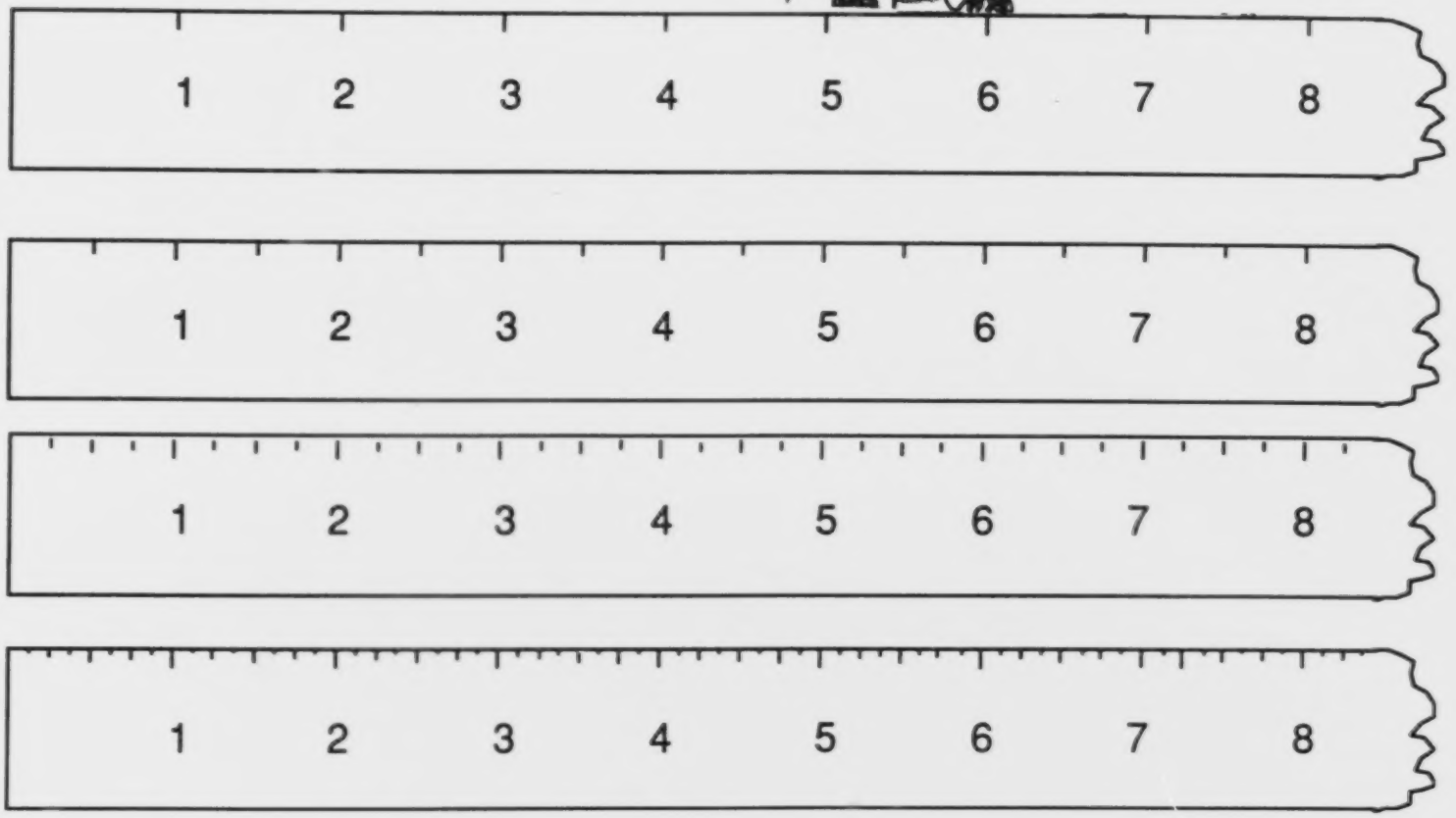
2. Have students estimate (do not allow rulers) and record their estimates on "Classroom Trivia" and/or "How do you Measure Up?"

3. Meaure objects previously estimated and complete "Classroom Trivia" or "How do you Measure Up?" (Decide on appropriate degree of accuracy)

After Class	
"Code to Portia"	Reinforcement
Research the history of linear measurements and origins of specific units of measurement (e.g., inch, foot, yard)	Extension

PORTIA'S COMPLAINT

PORTIA: I was absent when you taught rulers. It's not my fault!



OBJECT	ESTIMATION	ACTUAL MEASUREMENT
Length of your desk		
Width of your desk		
Height of file cabinet		
Length of room		
Width of room		
Height of door		
Length of your book		
Thickness of desk top		
Diameter of clock		
Now think of your own		
(Less than 1")		
1)		
2)		
(Less than 1')		
1)		
2)		
(Less than 1 yard)		
1)		
2)		

HOW DO YOU MEASURE UP?

Object	Estimation	Actual Measurement (to nearest inch)
Height		
Arm span		
Hand span		
Head		
Foot		
Little finger		
Width across palm		
Width of thumb		
Length of smile		
Longest hair on your head		

Some interesting measurements!
Distance from nose to end of extended arm is approx. 36" (adult).
Span of hand is approx. 7 inches. Sheet of paper is 8 1/2" X 11".
Pens are approx. 6" long.

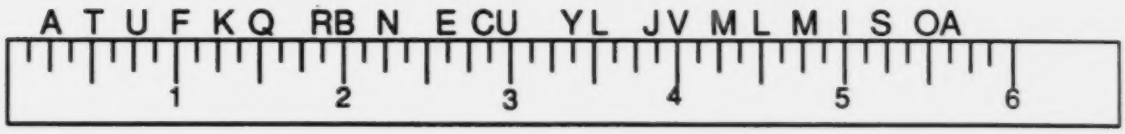
Now use the back of your paper to write 5 ratios comparing the lengths of various parts of your body.

CODE TO PORTIA

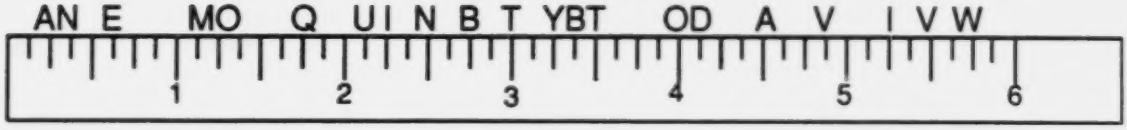
To help Portia with her ruler skills, Horatio has left her a secret message which she must decode by reading these rulers.

1. I will meet you at

_____ _____.
1 1/2, 3/4, 5, 2 1/4, 2 7/8, 3 3/8, 4 1/4, 5 5/8, 1 7/8, 1 1/4, 2 5/8, 1/2

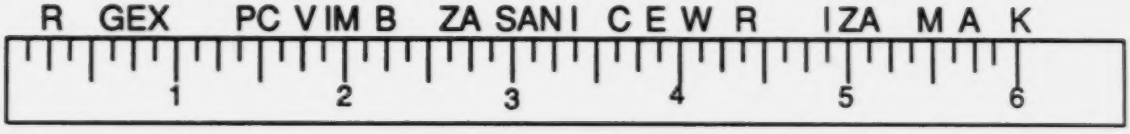


2. around _____.
2 1/2, 4, 1 1/4, 3/8, 3 1/2, 5 1/4, 1 1/8, 5/8



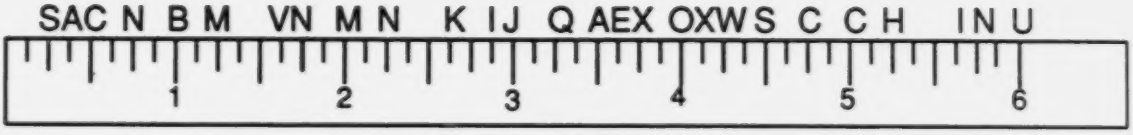
3. We should plan to meet at

_____ _____.
1 3/8, 3 3/8, 2 5/8,5, 3 7/8, 4 3/8, 1 7/8, 5 3/4, 1/4, 6/8, 5/8, 4 7/8, 3 1/4, 2 3/4



4. Do you want pepperoni, mushroom, onion pepper, or

_____?
3 1/2, 2 1/4, 4/8, 5 1/4, 4, 1 5/8, 2 7/8, 3 5/8, 4 1/2



WHERE'S MY CART?

Topic/Objective	Materials Needed
Reading a Ruler Estimating Skills	Rulers

During Class:

Use "The Name Game" and/or "The Match Game" to reinforce skills.

After Class

"Take the Bull by the Horns" Extension

STICKER SHEET FOR BULLMARKET LESSONS

THE MATCH GAME

HEART STOP

BEAR WARES

STRAWBERRY PATCH

T-STOPS

DOUBLE SCOOP

FLOWER POWER

BALLOONS A-FLOAT

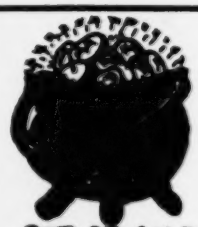
COOKIE JAR

THE NAME GAME

END OF THE RAINBOW

SWEET TOOTH

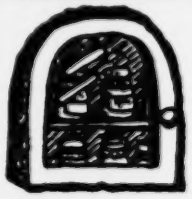
PIECE OF PIZZA


POT OF GOLD

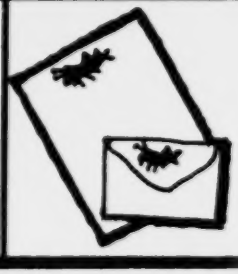
BUTTON BOUTIQUE

BOOK WORM

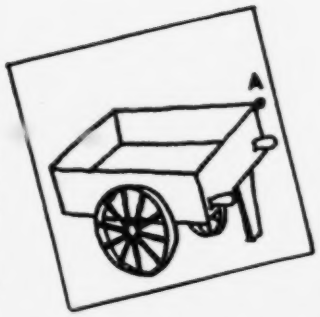
POWDER PUFF

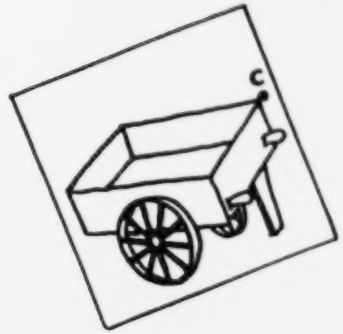

COUNTRY CUPBOARD

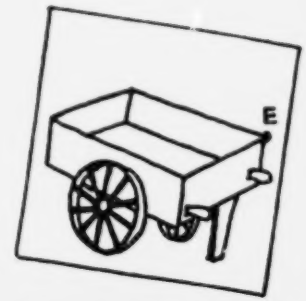
TAKE THE BULL BY THE HORNS

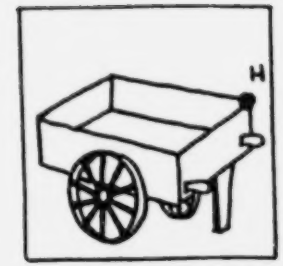


THE MATCH GAME









GRASSHOPPER: You know, I'm the symbol of Faneuil Hall Marketplace.

CROW: Well, I'm the symbol of logic and common sense.

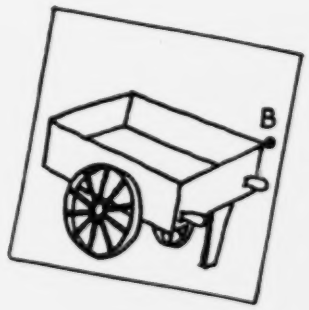
HORATIO: And I know how to match all the carts with their symbols.

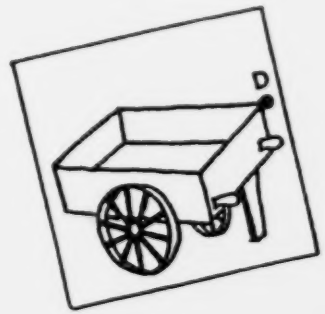
GRASSHOPPER: How can you do that?

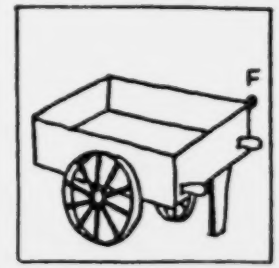
HORATIO: I learned how to measure! I'll show you how!

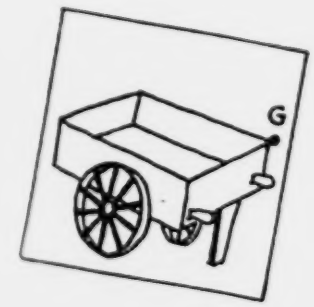
Directions: Find each cart by measuring from dot to dot. Cut out the stickers from the sticker sheet for Bull Market Lessons and paste on each cart correctly.

1. From A to the **Cookie Jar** cart is 4 2/4".
2. From C to the **Bear Wares** cart is 2 3/4".
3. **The Strawberry Patch** is 2 1/4" from the **Cookie Jar**.
4. The **T-Stops** cart is 3 1/4" from C.
5. **Heart Stop** is 2 2/4" away from **The Strawberry Patch**.
6. **The Double Scoop** is 6 3/4" from D.
7. The **Flower Power** cart is 3 1/4" from **T-Stops**.
8. 9 2/4" from **Bear Wares** is **Balloons-A-Float.**

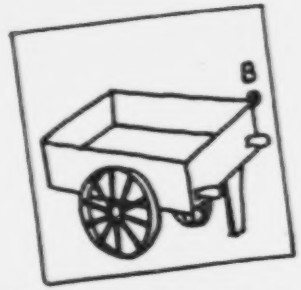


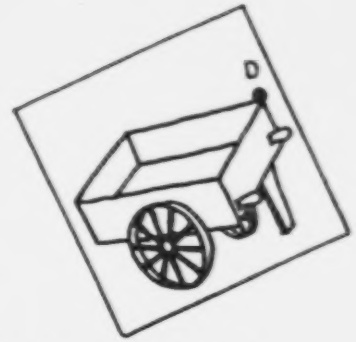






THE NAME GAME





HORATIO: I'm not sure where all the carts are in the Bull Market.

PORTIA: It's perfectly obvious to me where they are!

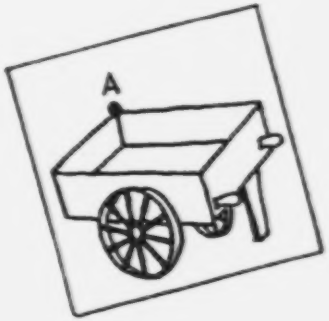
CROW: O.K. then, Portia, where's **The Country Cupboard**?

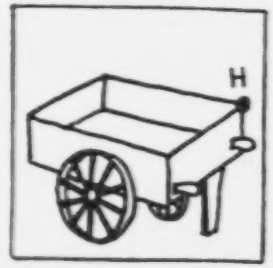
PORTIA: Well, it's, uh, um..., over there, near the, uh, um, or I think maybe it's near the ...

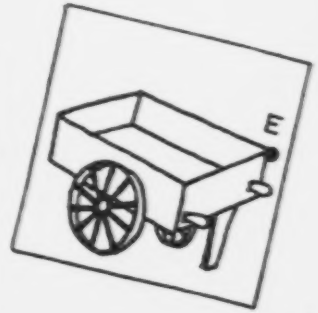
CROW: I think there's a way we can measure and figure out where they are!

Directions: Find each Cart by measuring from dot to dot. Cut out the stickers from the sticker sheet for Bull Market Lessons and paste on each cart correctly.

1. From A to the **Sweet Tooth** is 7 1/2".
2. **Piece of Pizza** cart is 3 1/2" from **End of the Rainbow**.
3. 2 1/2" from B is the **Pot of Gold** jewelry cart.
4. The **Button Boutique** is 5 1/2" from **Pot of Gold.**
5. The distance from **Button Boutique** to **Book Worm** is 9 1/2".
6. **The Powder Puff** is 2" from **Book Worm.**
7. **The Country Cupboard** is 6 1/2" from cart G.
8. **End of the Rainbow** is 5 1/4" from **Sweet Tooth.**







TAKE THE BULL BY THE HORNS

DIRECTIONS:

1. Name each cart. Use the "Take the Bull by the Horns" sheet. Put an appropriate symbol in each cart (or create your own). Save this as an answer sheet.

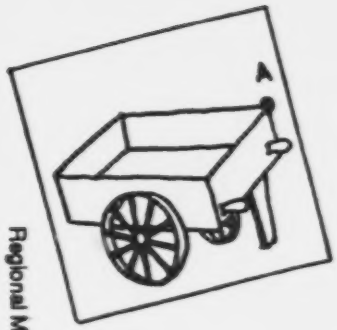
2. Write a set of directions for the points similar to the Bull Market Cart lessons.

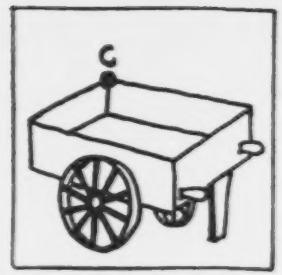
PUZZLES BY_____ (YOUR NAME)

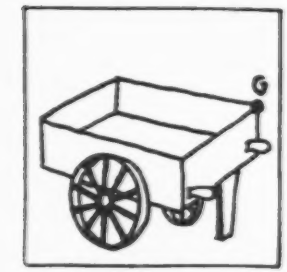
DIRECTIONS:

1. From point A to _____ measures _____.
2. _____ _____ _____ _____.
3. _____ _____ _____ _____.
4. _____ _____ _____ _____.
5. _____ _____ _____ _____.
6. _____ _____ _____ _____.
7. _____ _____ _____ _____.
8. _____ _____ _____ _____.
9. _____ _____ _____ _____.
10. _____ _____ _____ _____.
11. _____ _____ _____ _____.
12. _____ _____ _____ _____.

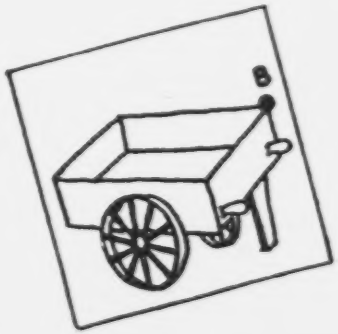
Are you an expert game creator? Give your directions and a blank Bull Market Cart sheet to a classmate to solve.

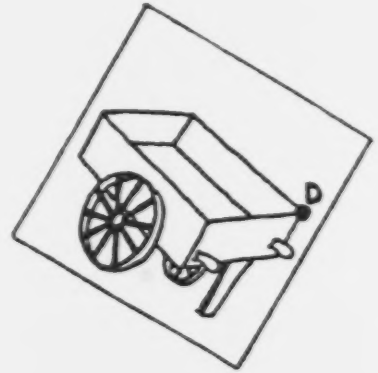


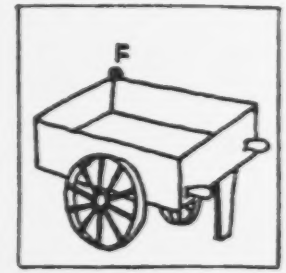


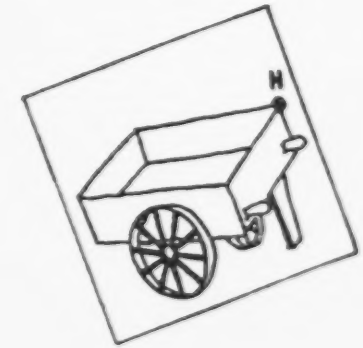


Take the Bull by the Horns









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LINE UP

Topic/Objective	Materials
Measuring to nearest 1/8"	Rulers Adding Machine Tape or masking tape (1 yd. for every 2-3 students.) Length cards, cut a sufficient number for all groups and put each set in a container.

During Class:

Arrange class into groups of two or three students. Students take turns drawing a length card and marking off the lengths indicated on their tape. First group to complete the length of their tape wins. Groups check each other's work.

Example:

First student chooses 3/4" and marks that length on tape.
Next student chooses 1/2" so must mark 1 1/4" on the tape.

After Class

"As the Grasshopper Hops" Extension

LENGTH CARDS

7/8"	1 3/4"	3 7/8"	5"
5/8"	1 1/4"	3 3/4"	4 7/8"
3/8"	1 1/2"	3 1/2"	2 5/8"
1/8"	4"	2 7/8"	4 1/2"
3/4"	3"	2 3/8"	3 3/8"
1/4"	2"	2 1/8"	4 5/8"
1/2"	1"	2 1/2"	4 3/4"

AS THE GRASSHOPPER HOPS

Use the Boston Back Bay Map.
Measure all map lengths of streets to the nearest 1/4".
YOU MUST TRAVEL ONLY ON THE STREETS.

1. Measure the map length of Marlborough Street. _____ (Note Marlborough Street runs from Massachusetts Avenue to Arlington Street.)

2. Measure the map length of Gloucester Street. _____

3. Find the shortest distance from the corner of Fairfield Street and Beacon Street to the corner of Dartmouth Street and Newbury Street.

   _____

   Using different streets, find another route to reach the same destination. Record the distance and explain your route. _____

4. Traveling from the corner of Boylston Street and Hereford Street to the corner of Exeter Street and Newbury Street , how many different routes can you find? _____

5. How many inches will the grasshopper travel on this map route:

   Begin at the corner of Massachusetts Avenue and Beacon St.
   Hop down Beacon St. and turn right on Hereford St.,
   Hop down Hereford St. and turn left on Newbury St.,
   Hop down Newbury St. and turn left on Dartmouth St.,
   Hop down Dartmouth St. and turn right on Marlbourgh St.,
   Hop to Berkeley St.

   _____

   If 1 inch = 1/8 mile, approximately how many miles would the grasshopper have traveled if he took the <u>real</u> trip?

   _____

6. If a three inch grasshopper can hop approximately twenty times his length, how many hops will it take him to cover the route in question five? This is tough!_____

AS THE GRASSHOPPER HOPS (II)

7. Find the spot:

Begin at the corner of Arlington St. and Newbury St. and go
1 1/2" down Newbury St.
Turn right and go 2 3/4".
Turn left and go 3 1/4".
Turn left and go 3 3/4"
Turn right and go 1 1/2"

Use street names to tell where you would be at the end of the trip.

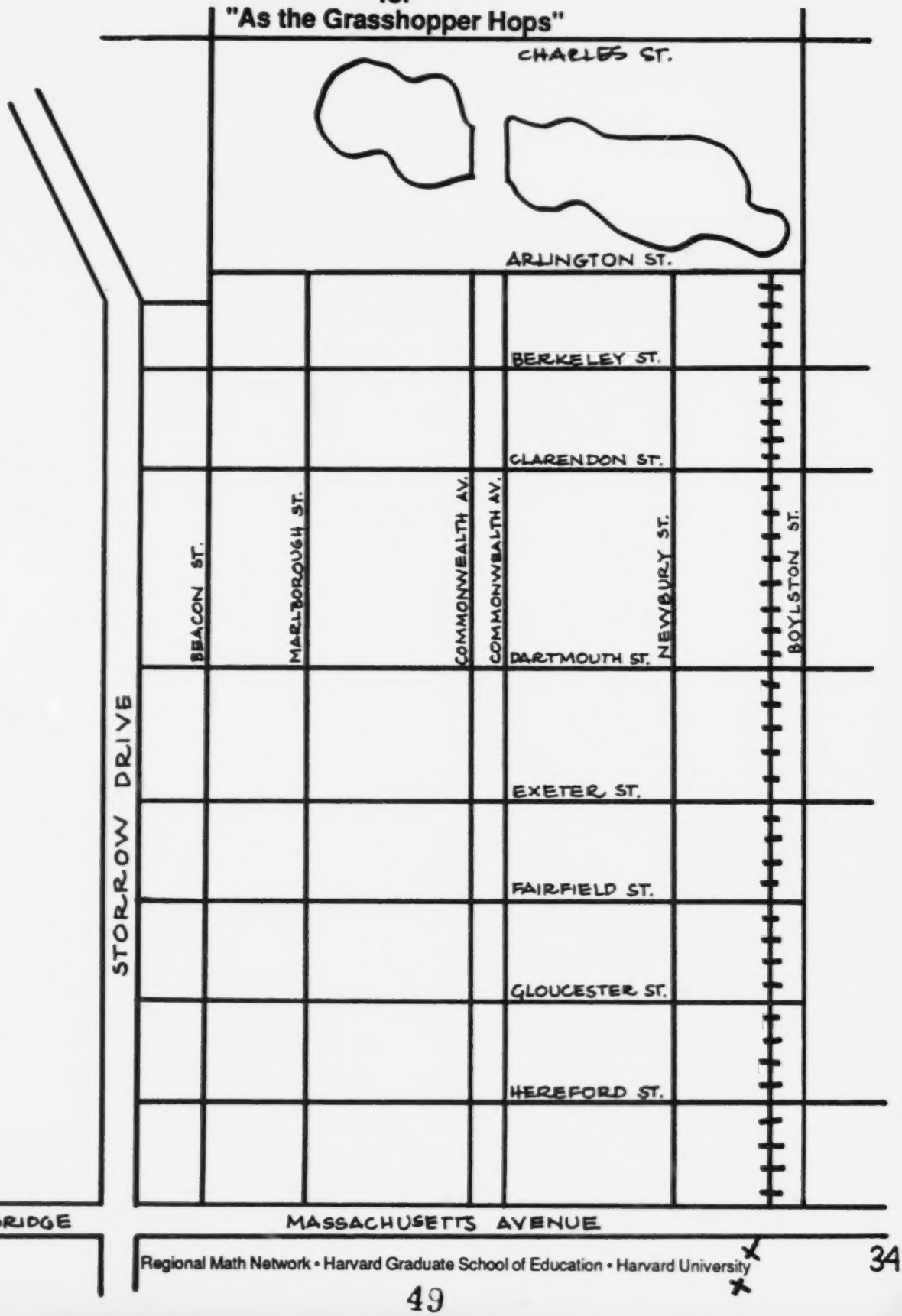
_____

Approximately how many <u>miles</u> would this trip be if 1" = 1/8 mile?

_____

Boston Back Bay Map
for
"As the Grasshopper Hops"

Extension



CODE TO PORTIA

To help Portia with her ruler skills, Horatio has left her a secret message which she must decode by reading these rulers.

1. I will meet you at
   QUINCY MARKET.
   1 1/2, 3/4, 3, 2 1/4, 2 7/8, 3 3/8, 4 1/4, 5 5/8, 1 7/8, 1 1/4, 2 5/8, 1/2

2. around **NOON TIME**.
   2 1/2, 4, 1 1/4, 3/8, 3 1/2, 5 1/4, 1 1/8, 5/8

3. We should plan to meet at
   PIAZZA REGINA.
   1 3/8, 3 3/8, 2 5/8, 3, 3 7/8, 4 3/8, 1 7/8, 5 3/4, 1/4, 6/8, 5/8, 4 7/8, 3 1/4, 2 3/4

4. Do you want pepperoni, mushroom, onion pepper, or
   ANCHOVIES?
   3 1/2, 2 1/4, 4/8, 5 1/4, 4, 1 5/8, 2 7/8, 3 5/8, 4 1/2

THE MATCH GAME

GRASSHOPPER: You know, I'm the symbol of Faneuil Hall Marketplace.
CROW: Well, I'm the symbol of logic and common sense.
HORATIO: And I know how to match all the carts with their symbols.
GRASSHOPPER: How can you do that?
HORATIO: I learned how to measure! I'll show you how!

Directions: Find each cart by measuring from dot to dot. Cut out the stickers from the sticker sheet for Faneuil Hall Marketplace Lessons and paste on each cart correctly.

1. From A to the Cookie Jar cart is 4 3/4".
2. From C to the Bear Wares cart is 2 3/4".
3. The Strawberry Patch is 2 1/4" from the Cookie Jar.
4. The T-Stops cart is 3 1/4" from C.
5. Heart Stop is 2 3/4" away from The Strawberry Patch.
6. The Double Stoops is 6 3/4" from D.
7. The Flower Power cart is 3 1/4" from T-Stops.
8. 9 3/4" from Bear Wares is Balloons-A-Float.

THE NAME GAME

HORATIO: I'm not sure where all the carts are in the Bull Market.
PORTIA: It's perfectly obvious to me where they are!
CROW: O.K. then, Portia, where's The Country Cupboard?
PORTIA: Well, it's, uh, um..., over there, near the, uh, um, or I think maybe it's near the ...
CROW: I think there's a way we can measure and figure out where they are!

Directions: Find each Cart by measuring from dot to dot. Cut out the stickers from the sticker sheet for Bull Market Lessons and paste on each cart correctly.

1. From A to the Sweet Tooth is 7 1/2".
2. Piece of Pizza cart is 3 1/2" from End of the Rainbow.
3. 2 1/2" from B is the Pot of Gold jewelry cart.
4. The Button Boutique is 5 1/2" from Pot of Gold.
5. The distance from Button Boutique to Book Worm is 9 1/2".
6. The Powder Puff is 2" from Book Worm.
7. The Country Cupboard is 6 1/2" from cart G.
8. End of the Rainbow is 5 1/4" from Sweet Tooth.

AS THE GRASSHOPPER HOPS

Extension

Use the Boston Back Bay Map.
Measure all map lengths of streets to the nearest 1/4".
YOU MUST TRAVEL ONLY ON THE STREETS.

1. **Measure the map length of Marlborough Street.** 7 ¼" (Note Marlborough Street runs from Massachusetts Avenue to Arlington Street.)

2. **Measure the map length of Gloucester Street.** 5"

3. Find the shortest distance from the corner of Fairfield Street and Beacon Street to the corner of Dartmouth Street and Newbury Street.
   5 ¼"

   Using different streets, find another route to reach the same destination. Record the distance and explain your route. _____

4. Traveling from the corner of Boylston Street and Hereford Street to the corner of Exeter Street and Newbury Street, how many different routes can you find? 4 versions of the shortest route.

5. How many inches will the grasshopper travel on this map route:

   Begin at the corner of Massachusetts Avenue and Beacon St.
   Hop down Beacon St. and turn right on Hereford St.,
   Hop down Hereford St. and turn left on Newbury St.,
   Hop down Newbury St. and turn left on Dartmouth St.,
   Hop down Dartmouth St. and turn right on Marlbourgh St.,
   Hop to Berkeley St.

   12 ½"

   If 1 inch = 1/8 mile, approximately how many miles would the grasshopper have traveled if he took the real trip?

   1 ½ miles

6. If a three inch grasshopper can hop approximately twenty times his length, how many hops will it take him to cover the route in question five? This is tough! 1584 hops

AS THE GRASSHOPPER HOPS (II)

Extension

7. Find the spot:

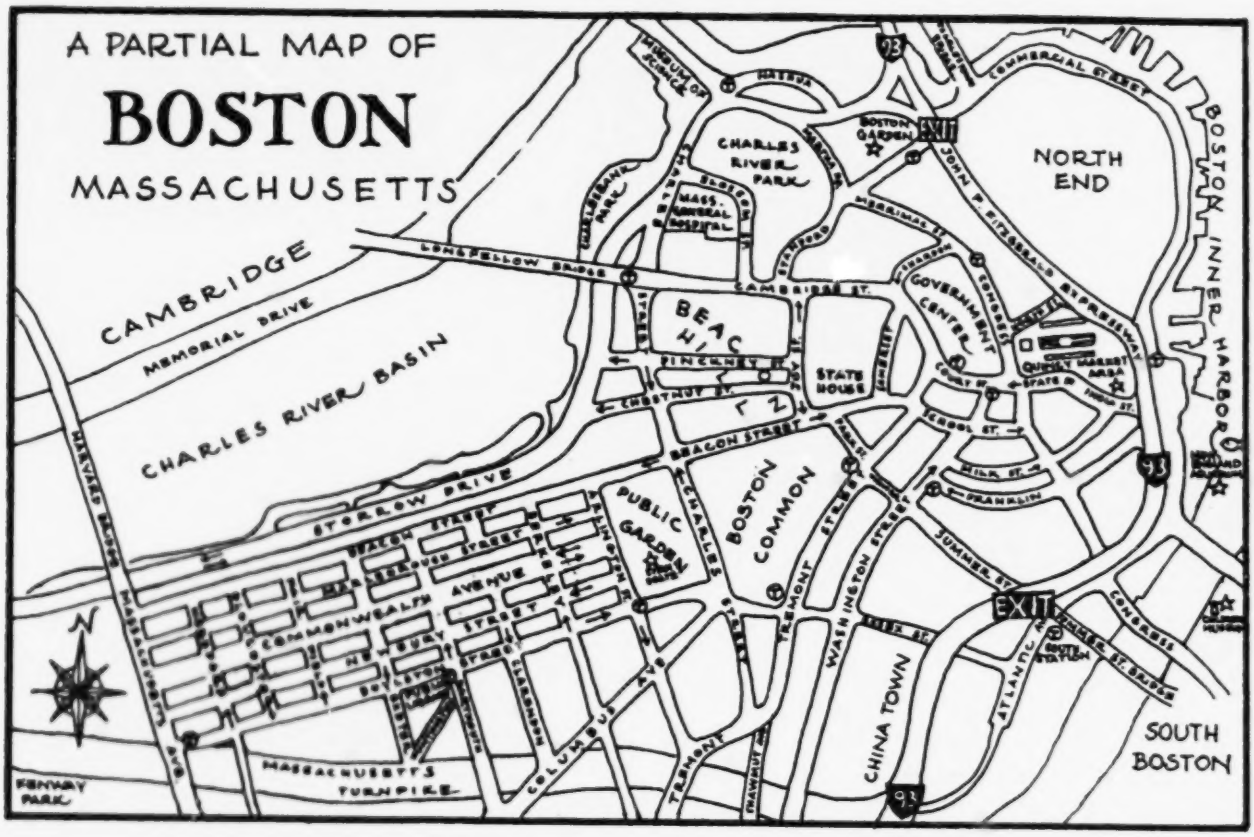
   Begin at the corner of Arlington St. and Newbury St. and go
   1 1/2" down Newbury St.
   Turn right and go 2 3/4".
   Turn left and go 3 1/4".
   Turn left and go 3 3/4".
   Turn right and go 1 1/2"

   Use street names to tell where you would be at the end of the trip.

   The corner of Hereford St. and Boylston St.

   Approximately how many miles would this trip be if 1" = 1/8 mile?

   1 ⅝ miles.



MAP EXPLORATION

MAP EXPLORATION

Topic/Objective	Materials
Coordinate System, Scales, Ratio and Proportion Distances within a Specific Circle	Boston and Vicinity Map Review map and coordinates before class

During class:

1. Introduce the Boston and Vicinity Map.
   a. Arrange students in groups and let them examine the map for 5 minutes. Discuss and list some of the pertinent information.
   b. Locate Quincy Market and your town. Discuss possible routes between them.

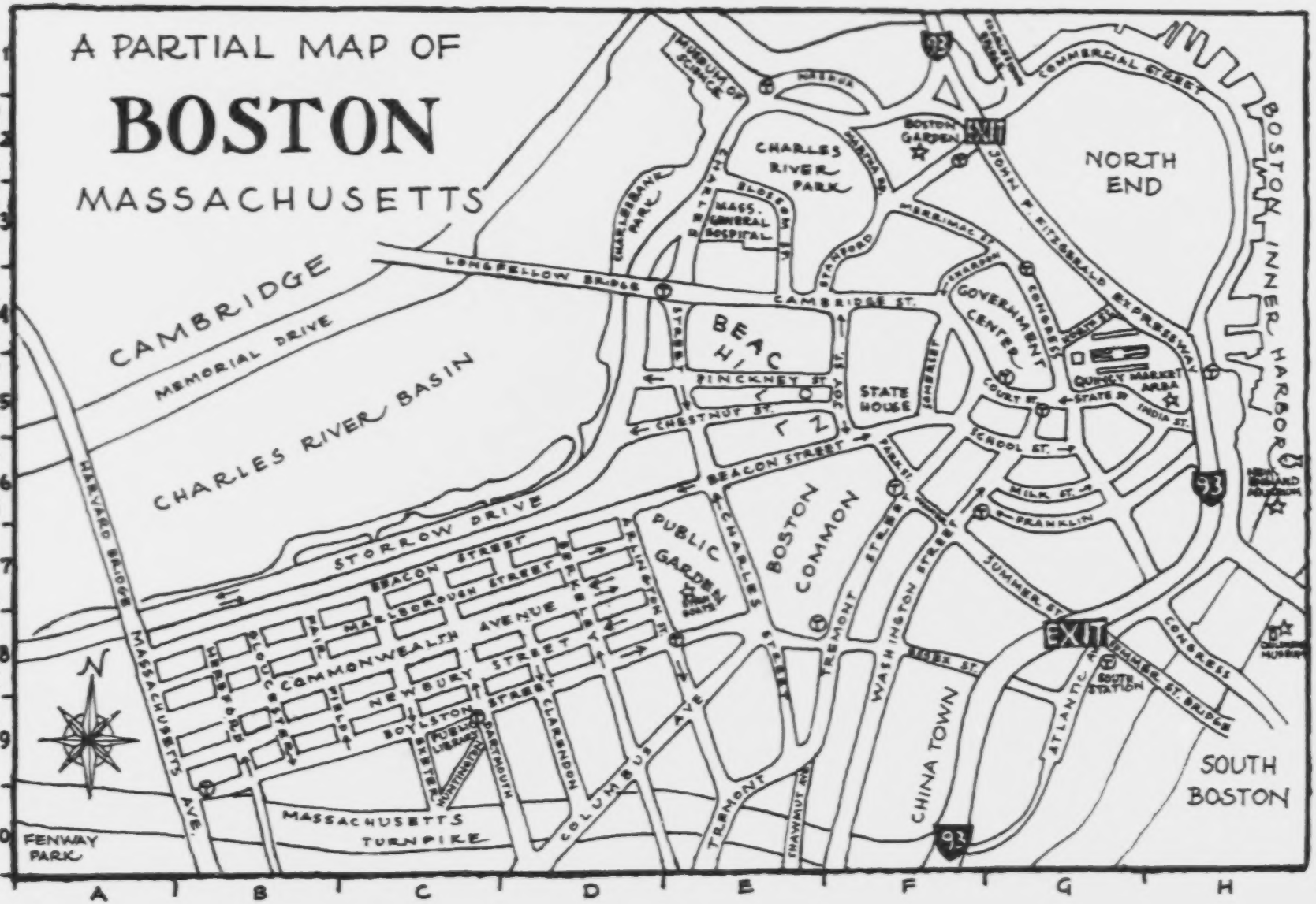
2. Discuss coordinates.

3. Play a game "I'm thinking of a town." (Student says "I'm thinking of a town in G-4.") Other students must identify that town (same idea as 20 questions). Questions must be ones requiring only a "yes" or "no" answer.

After Class

Partial Map of Boston — Extension

Have students generate questions about this map or write your own questions on the board. (e.g. Give the coordinates for Fenway Park or what town is found in A10?)


A PARTIAL MAP OF
BOSTON
MASSACHUSETTS
CAMBRIDGE
MEMORIAL DRIVE
CHARLES RIVER BASIN
LONGFELLOW BRIDGE
CAMBRIDGE ST.
CHARLES RIVER PARK
MASS. GENERAL HOSPITAL
MUSEUM OF SCIENCE
BOSTON GARDEN
NORTH END
COMMERCIAL STREET
BOSTON INNER HARBOR
JOHN F. FITZGERALD EXPRESSWAY
GOVERNMENT CENTER
QUINCY MARKET AREA
STATE HOUSE
BEACON HILL
PINCKNEY ST.
CHESTNUT ST.
BEACON STREET
STORROW DRIVE
HARVARD BRIDGE
MASSACHUSETTS AVE.
PUBLIC GARDEN
BOSTON COMMON
SCHOOL ST.
MILK ST.
FRANKLIN
SUMMER ST.
CONGRESS
EXIT
SOUTH STATION
SOUTH BOSTON
CHINA TOWN
WASHINGTON STREET
TREMONT STREET
COMMONWEALTH AVENUE
BOYLSTON STREET
NEWBURY STREET
MARLBOROUGH STREET
PUBLIC LIBRARY
MASSACHUSETTS TURNPIKE
FENWAY PARK
COLUMBUS AVE.
CLARENDON
DARTMOUTH
93
N
A
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F
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9
10

BOSTON AND VICINITY

Topic/Objective	Materials
Scales - Ratio and Proportion Distances within a specific radius	Boston and and Vicinity Map Rulers, String, Compass, or Circle transparencies (masters included)

During class:

1. Calculate distances using scale measure.
   Have the student:
   a. Give the scale measure of the map (1" = 2 miles).
   b. Measure approximate mileage between two towns by measuring from the first letter of one to the first letter of the other. Explain that we have chosen this method because it is well defined, but the method can be misleading. Is it really only one mile from Belmont to Arlington--should we measure from center of town to center of town? Can we tell the center of town from this map? Can anyone think of another accurate method?

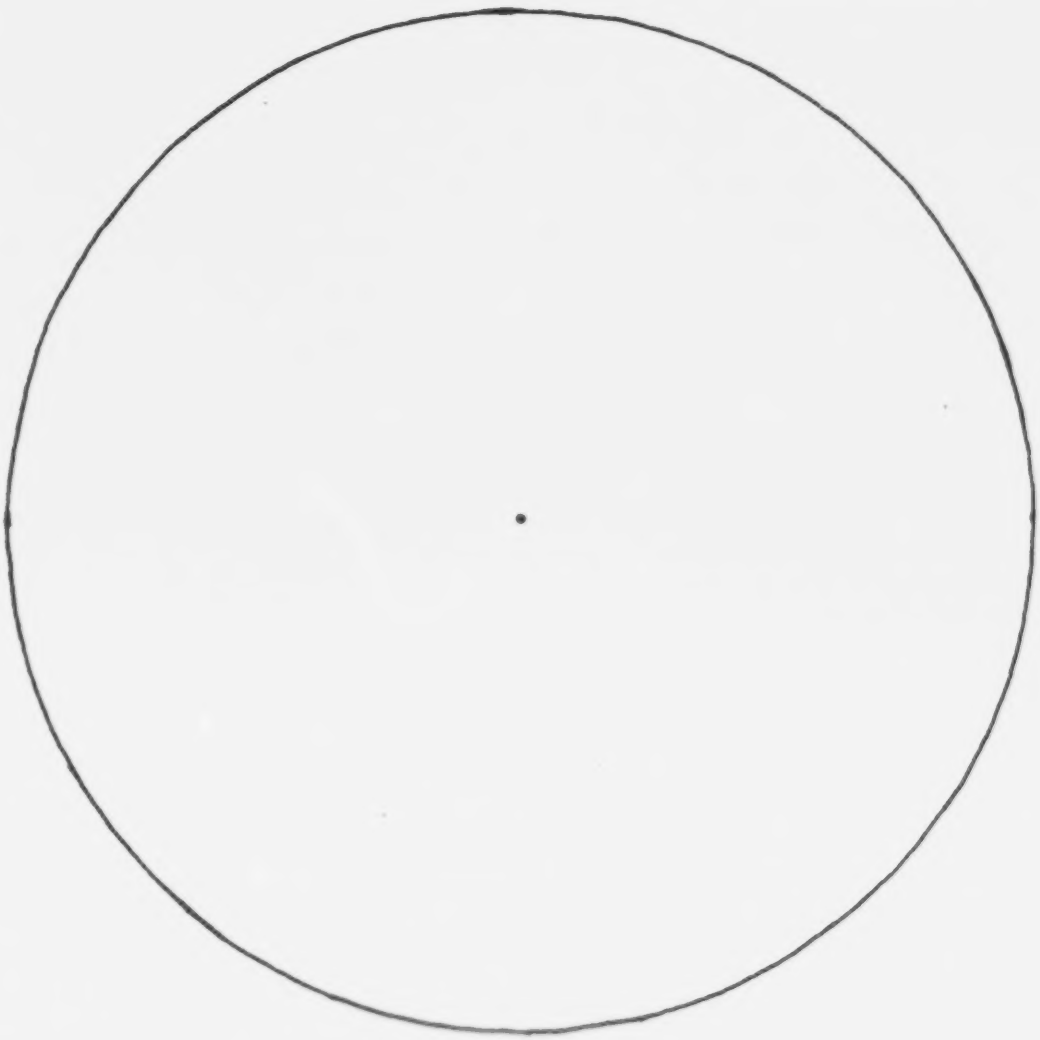
   1. Newton to Chelsea (9 miles)
   2. Brookline to Medford (7 1/2 miles)
   3. Lexington to Bedford (4 miles)
   4. Boston to Newton (8 miles)
   5. Holliston to Wellesley (10 1/2 miles)
   6. Dedham to Hingham (14 miles)
   7. Acton to Natick (15 1/2 miles)
   8. Peabody to Revere (9 miles)
   *9. Your town to other towns.
   *10. Your town to Quincy Market.

2. Determine distance using a radius and make a chart. (optional)
   Review the meaning of the term radius and teach students how to determine towns within a specific circle using transparencies, string, or compass.
   Have the student:
   a. List the towns within a 5 mile radius of Winchester and record. (Lexington, Arlington, Belmont, Medford, Malden, Melrose, Stoneham, Woburn, Burlington)
   b. List the towns within a 6 mile radius of Watertown and record. (Arlington, Medford, Somerville, Cambridge, Brookline, Newton, Waltham, Belmont)
   c. List those towns that are in both sets. (Arlington, Belmont, Medford)

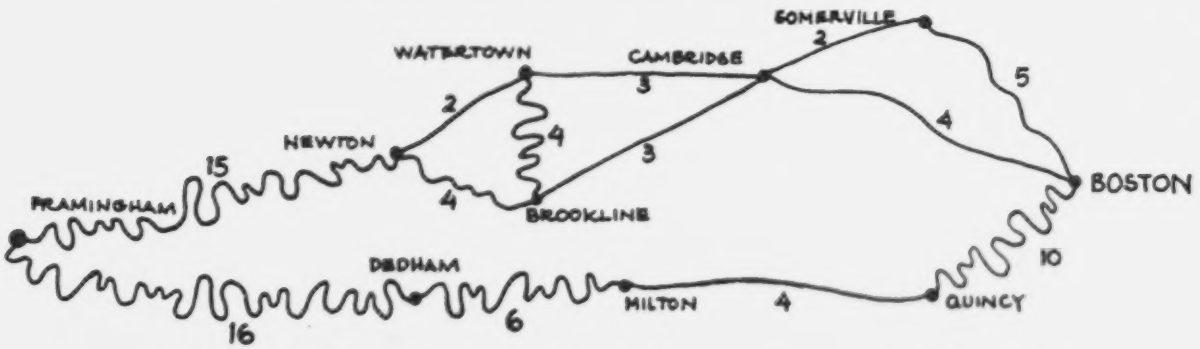
After Class	
"Routes from Boston"	Extension

5" Circle Transparency

6" Circle Transparency



ROUTES FROM BOSTON



1. How many miles is it from Boston to Cambridge to Watertown to Newton?
   _____

2. How many miles is it from Boston to Cambridge to Brookline to Newton?
   _____

3. How much further is it from Boston to Newton if you go through Somerville than if you take the most direct route? _____

4. Make a list of 2 different routes you can take from Boston to Framingham if you can't pass through the same city/town twice? Show the cities in order, using the first letter of each city name. Reminder: Use BO for Boston and BR for Brookline.

Example:

ROUTE	TOTAL NUMBER OF MILES
BO-C-W-N-F	20

Now find two other routes from Boston to Framingham.

_____ _____

_____ _____

5. What is the shortest route from Boston to Framingham?
   _____ How many miles? _____

6. How many miles is the longest route from Boston to Framingham if you can't pass through the same town/city twice? _____

7. Find a route which leaves Boston and visits every town/city just once and ends back in Boston. _____

   How many miles is it? _____

   Is there more than one route?_____

60

WHERE DOES THE CROW LAND?

Topic/Objective	Materials
Scale Linear Measure	Massachusetts map Push pins or thumbtacks 1 set of Crow cards

During class:

1. Arrange students in groups of 4-5. Give each group a map. Note that now students will measure from the centers of towns, not from first letters of names.

2. Give each group the same crow card. The group decides using the map where the push pin should be placed.

3. Choose a group at random to place the push pin on the bulletin board map. That group assigns a member to go to the bulletin board.

4. The other groups verify that the push pin has been correctly placed. If the pin was incorrectly placed, another group may try. Points should be awarded for correct placement and subtracted for incorrect placement.

After Class

Have students write their own crow cards to add to the deck

Have students develop a system for noting which push pin matches each crow card.

WHERE DOES THE CROW LAND?

# 1 The crow starts in Boston and flies 18 miles towards Lowell. Where does he land?	# 2 The crow starts in Lawrence and flies 21 miles toward Gloucester. Where does he land?	# 3 The crow starts in Chicopee and flies 33 miles toward Fitchburg. Where does he land?
# 4 The crow starts in Northhampton and flies19.5 miles toward Fitchburg. Where does he land?	# 5 The crow starts in Chelmsford and flies 16.5 miles toward Needham. Where does he land?	# 6 The crow starts in Fall River and flies 43.5 miles toward Worcester. Where does he land?

WHERE DOES THE CROW LAND?

# 7 The crow starts in Arlington and flies 19.5 miles toward Lunenberg. Where does he land?	# 8 The crow starts in Pittsfield and flies 51 miles toward Worcester. Where does he land?	# 9 The crow starts in Belmont and flies 45 miles toward Bourne. Where does he land?
# 10 The crow starts in New Bedford and flies 10.5 miles toward Nantucket State Forest. Where does he land?	# 11 The crow starts in Beverly and flies 26 miles toward Provincetown. Where does he land?	# 12 The crow starts in Lawrence and flies 4.5 miles toward Melrose. Where does he land?

WHERE DOES THE CROW LAND?

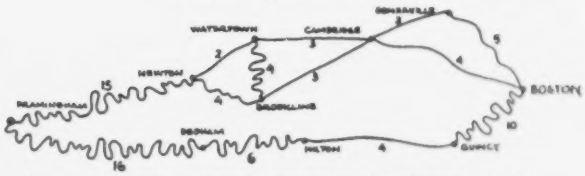
# 13 The crow starts in Cambridge and flies 9 miles toward Sudbury. Where does he land?	# 14 The crow starts in Palmer and flies 16.5 miles toward Stockbridge. Where does he land?	# 15 The crow starts in Pittsfield and flies 60 miles towards Fitchburg. Where does he land?
# 16 The crow starts in Foxborough and flies 60 miles toward Amherst. Where does he land?	# 17 The crow starts in Holden and flies 6 miles toward Hudson. Where does he land?	# 18 The crow starts in Newburyport and flies 12 miles toward Peabody. Where does he land?

WHERE DOES THE CROW LAND?

# 19 The crow starts in Bridgewater and flies 42 miles toward Amesbury. Where does he land?	# 20 The crow starts in Westfield and flies 60 miles toward Groton. Where does he land?	# 21 The crow starts in Boston and flies 103 miles toward Pittsfield. Where does he land?
# 22 The crow starts in Framingham and flies 19.5 miles toward Brockton. Where does he land?	# 23 The crow starts in Palmer and flies 22.5 miles toward Ashburnham. Where does he land?	# 24 The crow starts in Lynn and flies 12 miles toward Gloucester. Where does he land?

Extension

ROUTES FROM BOSTON



1. How many miles is it from Boston to Cambridge to Watertown to Newton?
   9 miles
2. How many miles is it from Boston to Cambridge to Brookline to Newton?
   11 miles
3. How much further is it from Boston to Newton if you go through Somerville than if you take the most direct route? 3 miles
4. Make a list of 2 different routes you can take from Boston to Framingham if you can't pass through the same city/town twice? Show the cities in order, using the first letter of each city name. Reminder: Use BO for Boston and BR for Brookline.

Example:	ROUTE	TOTAL NUMBER OF MILES
	BO-C-W-N-F	20

Now find two other routes from Boston to Framingham.

BO-C-BR-N-F	26 miles
BO-Q-M-D-F	36 miles

5. What is the shortest route from Boston to Framingham?
   BO-C-W-N-F How many miles? 24 miles
6. How many miles is the longest route from Boston to Framingham if you can't pass through the same town/city twice? 36 miles
7. Find a route which leaves Boston and visits every town/city just once and ends back in Boston. BO-Q-M-D-F-N-BR-W-C-S-BO

   How many miles is it? 69 miles

   Is there more than one route? yes

Teacher Notes

Answers for "Where Does the Crow Land?"

	Start	Toward	Distance (miles)	Lands
1.	Boston	Lowell	18	Billerica
2.	Lawrence	Gloucester	21	Essex
3.	Chicopee	Fitchburg	33	Barre
4.	Northampton	Fitchburg	19.5	Quabbin Reservoir
5.	Chelmsford	Needham	16.5	Waltham
6.	Fall River	Worcester	43.5	Northbridge
7.	Arlington	Lunenberg	19.5	Littleton
8.	Pittsfield	Worcester	51	Quabbin Reservoir
9.	Belmont	Bourne	45	Myles Standish Park
10.	New Bedford	Nantucket St. Forest	10.5	Buzzards Bay
11.	Beverly	Provincetown	26	Massachusetts Bay (ocean)
12.	Lawrence	Melrose	4.5	Andover
13.	Cambridge	Sudbury	9	Waltham
14.	Palmer	Stockbridge	16.5	Holyoke
15.	Pittsfield	Fitchburg	60	Phillipston
16.	Foxborough	Amherst	80	Quabbin Reservoir
17.	Holden	Hudson	6	Wachussett Reservoir
18.	Newburyport	Peabody	12	Topsfield
19.	Bridgewater	Amesbury	42	Danvers
20.	Westfield	Groton	60	Leominster
21.	Boston	Pittsfield	103	Peru
22.	Framingham	Brockton	19.5	Stoughton
23.	Palmer	Ashburnham	22.5	Barre
24.	Lynn	Gloucester	12	Manchester

RATIO AND PROPORTION

YOUR RATIOS

Topic/Objective	Materials
Ratio	Total school population by grade and sex. See Appendix for other useful statisitcs.

During Class:

1. Introduce the concept of a ratio as a comparison of two quantities using the "Your Ratios" chart (2 out of 3, 2 to 3, 2:3, 2/3).

   If class size is odd, you may choose to:
   - add yourself
   - add imaginary students
   - use calculators

   For school and town populations, you may choose to use rounded numbers.

2. Reduce ratios of larger numbers, if possible.

   - The ratio of a vote of 140,000 to 200,000 is equivalent to the ratio of a vote of 7 to 10.
   - If 400 out of 1000 people but ginger ale, this ratio is equivalent to 2 out of 5 people buying ginger ale.

   Simplify some examples from the chart.

3. Change some of these simplified ratios to percents.

After Class

"Your Ratios" Reinforcement

Add your own ratios and complete chart.

YOUR RATIOS

Your Classroom	Ratio	Simplified Ratio	Percent
Boys to total students			
Girls to total students			
Students to desks			
Blue-eyed students to total students			
Brown-eyed students to total students			
Left-handed students to total students			
Our class to total school population			
Population of seventh grade to town population			
Think of YOUR OWN RATIOS for the remaining spaces.			
1.			
2.			
3.			
4.			

PORTIA PREDICTS

Topic/Objective	Materials
Proportions	"Your Ratios" completed for last night's homework

During Class:

1. Introduce the concept of proportion with examples on the board. A proportion is an equation that states that two ratios are equal.
   A. Review from fractions:
   Reducing: If 4 out of every 8 students will go on a field trip, and 47 students go on a field trip, how many students are there in all?

$$\frac{4}{8} = \frac{47}{\boxed{?}}$$

   Expanding: If the ratio of boys to girls in your class is 4 to 5 and there are 15 girls in the class, how many boys are there in the class?

$$\frac{4}{5} = \frac{\boxed{?}}{15}$$

   B. Introduce cross multiplication:
   If I have a ratio of 2 candy bars for every 3 children, and I have 28 students, how many candy bars will I have?

$$\frac{2 \text{ candy bars}}{3 \text{ students}} = \frac{\boxed{?} \text{ candy bars}}{28 \text{ students}}$$

2. Use "Your Ratios" to generate new examples and in particular to predict statistics for the school.

After Class:

"Portia Predicts"
Textbook Examples of
Cross Multiplication
or Use QM data in Appendix
to generate questions

Reinforcement

PORTIA PREDICTS

Portia watched what foods were being sold at Quincy Market. She learned some interesting things. Can you use her research to answer these questions?

Assume: Quincy Market is open 10 hours every day, 7 days a week.*

1. At the Taco Maker Horatio observed that 20 tacos were sold in 30 minutes. At this rate, how many tacos would be sold in ...

_____ tacos in 1 hour	_____ tacos in 1 1/2 hours
_____ tacos in 5 hours	_____ tacos in 1 day
_____ tacos in 1 week	_____ tacos in 1 year

2. Portia was told the Pizzera Regina sells an average of 600 pizzas per day. At this rate, how many pizzas would be sold in ...

_____ pizzas in 1 hour	_____ pizzas in 5 hours
_____ pizzas in 1 week	_____ pizzas in 1 year

3. Horatio discovered the Boston Brownie sell 5 times as many brownies to adults as to young people, a 5 to 1 ratio. (Warning! This isn't a 1 to 5 ratio)

   1) If they sell a total of 180 brownies in 1 hour, how many were sold
      to adults?_____ to young people?_____

   2) How many brownies are sold in one day
      to adults?_____ to young people?_____

   3) How many brownies are sold in one week
      to adults?_____ to young people?_____

* Actually, Quincy Market is only open 6 hours on Sunday but for this set of predictions assume it is open 10 hours on Sunday.

ONE OF THE CROWD

Topic/Objective	Materials
Ratio, Proportions, Estimation, Prediction	

During Class:

1. What is the ratio of the number of seventh graders in your home town to the number of visitors to Quincy Market?

   Example:

   In one year 14,000,000 people visited Quincy Market. If Cambridge seventh graders were the only visitors that year, how many times would each seventh grader have had to visit Quincy Market?

   The ratio of Cambridge seventh graders to the number of visitors is:

   $$500 \text{ to } 14{,}000{,}000 \text{ or } \frac{500}{14{,}000{,}000} \text{ which reduces to } \frac{1}{28{,}000}$$

   Every seventh grader would have had to visit Quincy Market 28,000 times that year.

2. How many times would each seventh grader in Boston have to visit Quincy Market in order to total 14,000,000 visitors?

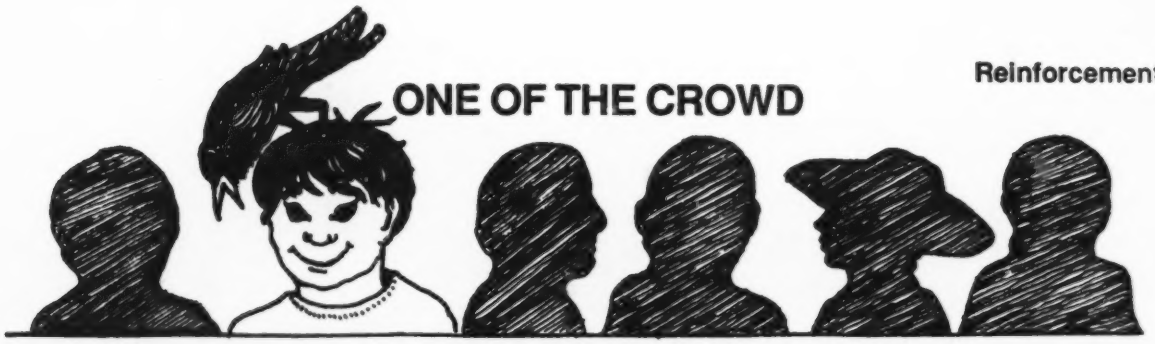
3. You may choose to generate some other examples from this chart or add statistics about towns not listed.

Town	Est. Grade 7 Population (1986)
Boston	4500
Cambridge	500
Hingham	275
Chelmsford	425
Lexington	350
Somerville	450
Waltham	450
Lincoln	125
Marblehead	175
Acton	300
Medford	375

After Class:

"One of the Crowd"	Reinforcement
"The Crowd According to Portia"	Extension

ONE OF THE CROWD



HORATIO: There sure are a lot of people here at Faneuil Hall Marketplace!
CROW: About 14,000,000 people visit every year.
HORATIO: Suppose every seventh grader in my school visited Quincy Market. How many times...
CROW: Poor Horatio. He'll never solve that one. We had better help him!

Town	Est. Grade 7 Population 1986	Town	Est. Grade 7 Population 1986
Boston	4500	Waltham	450
Cambridge	500	Lincoln	125
Hingham	275	Marblehead	175
Chelmsford	425	Acton	300
Lexington	350	Medford	375
Somerville	450		

Suppose your town decides to take <u>every</u> seventh grader in the town to Quincy Market for the day:

1. How many busses would you need if a school bus can carry 50 students?_____

   What is the ratio of students to busses in your town?_____

2. How many pizzas will you order if every student eats two pieces of pizza on the trip and each pizza has eight slices?_____

   What is the ratio of students to pizzas in your town?_____

3. One of the teachers took a survey on the way home and gathered the following information:

   How many students bought

   - 1/5 of the students bought T-shirts. — T-shirts? _____
   - 1/3 of the students bought jewelry. — Jewelry? _____
   - 3/4 of the students bought candy. — Candy? _____

4. Make up your own ratio questions about a trip to Quincy Market.

THE CROWD ACCORDING TO PORTIA

PORTIA: Boy, it's certainly crowded in here!! I can hardly move.

CROW: Did you know that between twelve and fourteen million people visited Faneuil Hall Marketplace last year?

GRASSHOPPER: No! Come on!! That's more people than visited Disney World last year.

PORTIA: It's perfectly obvious it's a reasonable estimate. In the last 15 seconds, I counted 16 people coming through that door. That's 64 in a minute. Wait a minute!! Where's my calculator?? Sixty-four times...

Did Portia estimate correctly? Check her figures.

(Hint: The market is open every day, 10 hours a day, Monday through Saturday. On Sunday it's open 6 hours)

SURVEY INTRODUCTION

Topic/Objective	Materials
Survey techniques Ratio, proportion	Overheads of: Bull's Eye View of the Carts Portia's Survey

During class:

1. Discuss cart locations and products sold at Quincy Market.
   Locate selected carts on overhead.
   Use scale drawing on bulletin board to identify specific locations on overhead (i.e. rotunda, doors, stairs, selected restaurants).

2. (Optional) Use these facts to generate discussion of carts:
   More than 1,000 different products are sold.
   Only 1% of the carts do not succeed.
   Cart rental is $175 to $250 per week.
   4 to 5 applications for carts are received each week.
   There is often a one-year waiting period to get a cart.
   New carts have a two-week probation period.

3. Introduce the idea of a survey using overhead of Portia's Survey.

4. Take class surveys on: favorite ice cream, favorite pizza, etc.

5. Explain that we use the ratios determined in a survey (eg. 10 out of 30 students in the class like chocolate ice cream) to make predictions about a larger group using proportions. Explain that in some situations proportions give us a good estimate but only if the sample of students has similar tastes to the larger group.

6. Explain that in other situations our predictions are much more accurate (e.g., on a map, if the scale is 1" = 3 miles and the distance from Cambridge to Lexington is 2", we can accurately predict that the distance will be 6 miles).

7. Discuss "How Will You Make Your Fortune" with students. Have them complete this for homework.

After Class	
"How Will You MakeYour Fortune"	Reinforcement

A BULL'S EYE VIEW OF THE CARTS

(JULY 1986)

Overhead

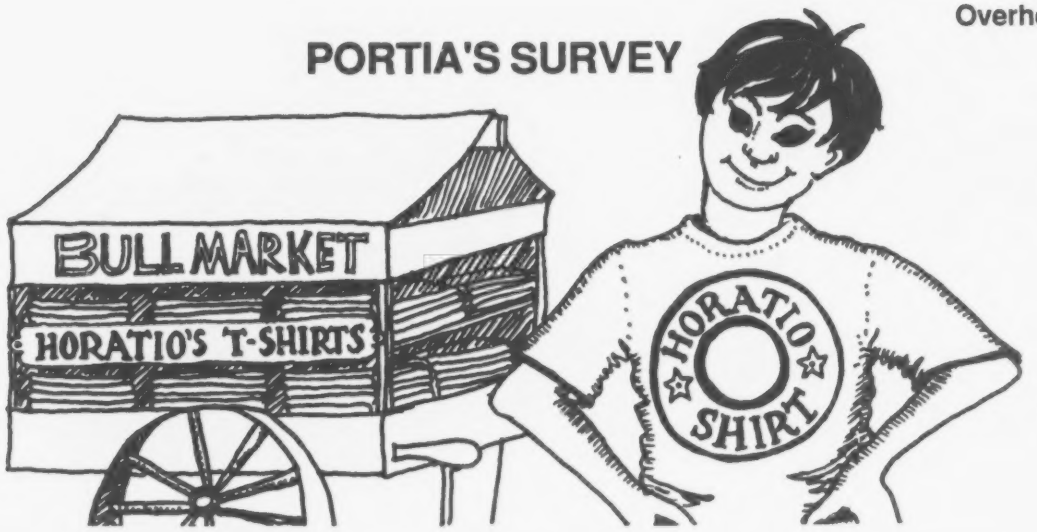
Key to a Bull's Eye View
(Bull Market Carts, July 1986)

1.	T-shirts	"Fanueil Hall"
2.	Sun glasses	
3.	T-shirts	"Boston"
4.	Buttons	make your own
5.	Christmas ornaments	personalized
6.	Just Dreaming	pillows with sayings or names
7.	Wild clothes	jams, dresses, Hawaiian shirts
8.	Earrings	
9.	Embroidery	pillows, scarfs. etc.
10.	Top Deck	beach chairs
11.	T-shirts	"Harvard", "Boston College"
12.	Scribbly Things	color Boston picture (for young children)
14.	Mini Chimes	all kinds of chimes
15.	Hand Painted	welcome signs, thimbles, trinket boxes, refrigerator magnets
16.	T-shirts	"Feed the World"
17.	Personalized name posters	
18.	Sign Maker	made to order
19.	T-shirts	"Boston whale watching"
20.	Posters and note paper	
21.	T-shirts	"Boston Greeting Cod"
22.	Coke hats	straws attached
23.	Shells, plant hangers, and chimes	
24.	Tales and Tails	stuffed animals
25.	Boston Fans	cups, dishes, bumper stickers
26.	T-shirts	"Boston"
27.	Ceramic chimes	butterfly, rainbow
28.	Truly Boston	visor caps, napkins, commuter mugs
29.	T-shirts	Boston Lobsters, "I love Boston", Boston Beach Club
30.	Pocket Book	wallets, bags
31.	Jewelry	gold pins, charms
32.	Glass	window sun catchers
33.	Li'l Lefty Shop	bags, cups, playing cards
34.	Dinosaurs	puzzles, school bags, stuffed animals
35.	Rainbow Connection	belts
36.	Mail a Heart	personalize your heart, earrings, pins
37.	Celebration	clown dolls, door wreaths, bagel magnets
38.	Straw bags	pocket books
39.	Music theme	shopping bags, cups, hats, key chains, note paper, aprons
40.	Cat theme	cups, banners, leashes, figurines, address books, placques
41.	Glass	lanterns, floating candles
42.	Wizard Shop	figurines, note paper, crystals
43.	Marcus and Me	leather bags, belts
44.	Precious Cargo	t-shirts, cups, bags
45.	Leather bags	pocket book
46.	Cape Cod Porcelin	lamps, vases, dishes

Bull Market Carts (cont)

47.	Hand woven items	dresses, scarves, belts
48.	Expressions by Chari	umbrellas (with messages or names)
49.	Paintings	framed (Boston, etc.)
50.	Caligraphy and Quotes	plaques with quotes
51.	Notable Names	visor caps, baby clothes
52.	Bagtime	quilted bags, ties
53.	Concord Hand Design	pottery, plant pots
54.	Salt Marsh Pottery	hand-painted pottery, bells, boxes
55.	Ireland	Irish toilet paper, plaques, shirts, hats, etc.
56.	Handmade mice	door decorations and stuffed animals
57.	Inkidincado	rubber stamps
58.	American Cup	"American Cup" t-shirts, shorts, visors, mugs
59.	Purple Panache	bags, earrings, scarves, pins
60.	Greater Boston Tea Co.	t-shirts

PORTIA'S SURVEY



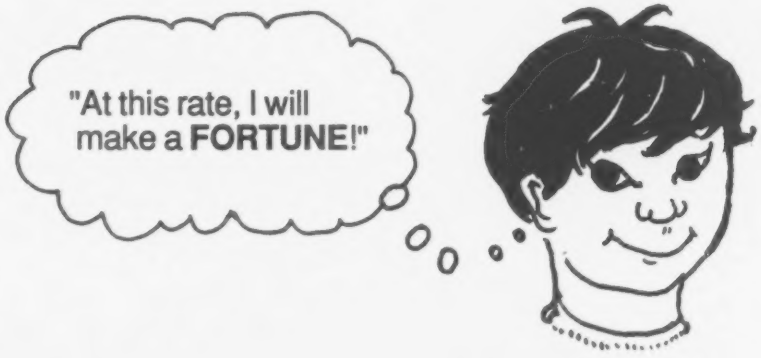
PORTIA: It seems perfectly obvious to me that no one would want a Horatio T-shirt.

HORATIO: Well, I like it!

PORTIA: I think we should take a survey.

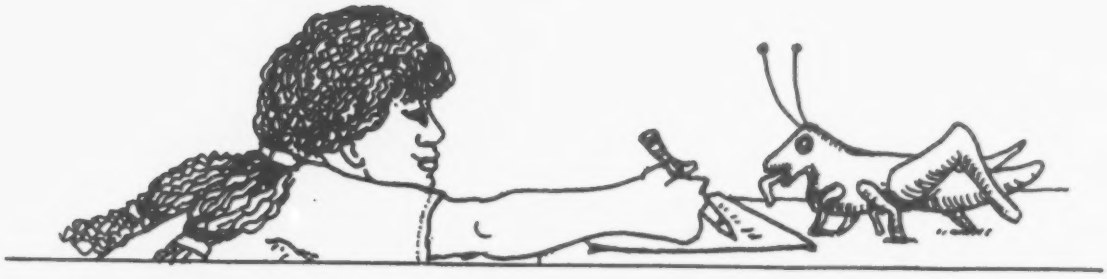
Portia's Survey

T-shirts	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	60
Jewelry	𝍸 /	6
School Supplies	//	2
Stuffed Animals	𝍸 ////	9
Buttons	///	3
	Total Survey	80



HOW WILL YOU MAKE YOUR FORTUNE?

Why not follow Portia's example.



Pretend you want to open a Bull Market cart at Quincy Market. Before you make your application you must decide what would be a profitable item to sell!

To do this you must:

- Choose 5 items to include in the survey and poll family and friends.
- Conduct your survey among 25 people of various ages.
- Record your information on the chart below.

_____'s Survey

ITEM	TALLY	ITEM TOTAL	PERCENT
	TOTAL		

Make up 5 questions using **Your Survey** results.

CREATING A BAR GRAPH

Topic/Objective	Materials
Survey techniques Graphing	Overhead of Portia's Survey Overhead of Steve's Ice Cream Bar Graph Large scaled graph paper (included) Construction paper (optional)

During class:

1. Review the techniques for and value of conducting a survey using Portia's Survey from previous lessons. Encourage students to give other examples.

2. Using the results of Steve's Ice Cream Survey, discuss bar graphs and the advantages of depicting information in graphical form. Guidelines for drawing bar graphs are included on Steve's Ice Cream Bar Graph.

3. Work through one of the bar graphs with students in class using Graph Your Stats.

4. (Optional) Discuss License Application which students complete after completing their bar graph.

After Class

"Tally-Ho!" — Reinforcement
"Steve's Ice Cream Survey" — Extension

STEVE'S ICE CREAM SURVEY

On a recent Tuesday afternoon Horatio took a 4 minute survey at Steve's Ice Cream Shop.

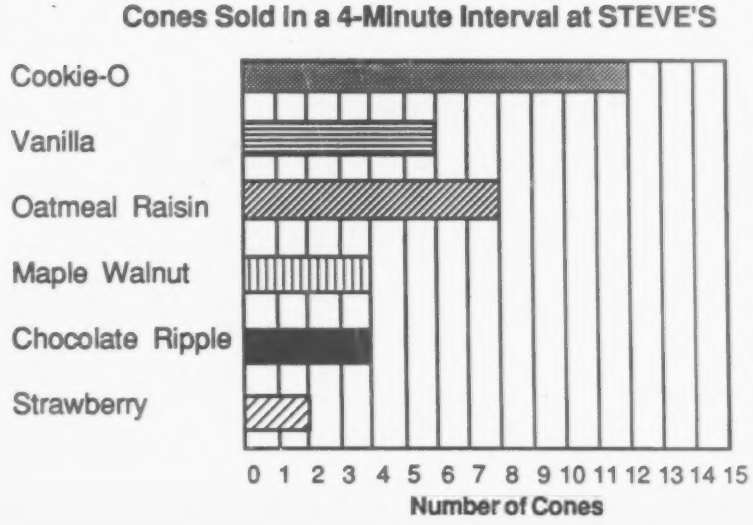
Flavor	Number of Cones Sold	Total
Cookie-O	𝍸 𝍸 //	12
Vanilla	𝍸 /	____
Oatmeal Raisin	𝍸 ///	____
Maple Walnut	////	____
Chocolate Ripple	////	____
Strawberry	//	____

Total Number of Cones Sold in Four Minutes. ☐

Steve's Ice Cream Bar Graph

Your bar graph must have:

1. Title that tells what graph is about
2. Labels--on side and bottom of your graph that tell the kinds of facts listed and how many
3. Bars--horizontal or vertical, that are of equal width and equally spaced


Cones Sold in a 4-Minute Interval at STEVE'S
Cookie-O
Vanilla
Oatmeal Raisin
Maple Walnut
Chocolate Ripple
Strawberry
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Number of Cones

65

GRAPH YOUR STATS

Your bar graph must have:

1. Title--that tells what graph is about
2. Labels--on side and bottom of your graph that tell the kinds of facts listed and the quantities of each
3. Bars--horizontal or vertical that are of equal width and equally spaced

Draw a bar graph for each of these tally sheets.

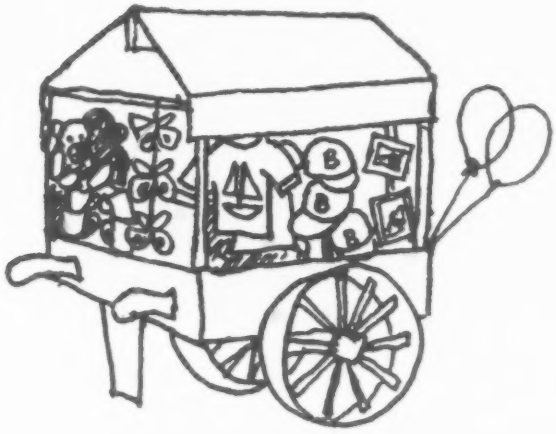
This tally sheet shows pounds of candy sold in one hour at Sweet Tooth in Quincy Market.

TALLY SHEET		
Gummi Bears	~~////~~ ~~////~~ ////	14
Licorice	~~////~~	5
Jelly Bears	~~////~~ ////	9
Sweet Tarts	~~////~~ //	7
M&M's	~~////~~ ~~////~~	10

This sheet shows the results of a survey on adult size T-shirts sold at a T-shirts cart in Quincy Market in one day.

TALLY SHEET		
Small	~~////~~	5
Medium	~~////~~ ~~////~~	10
Large	~~////~~ ~~////~~ ~~////~~ ~~////~~ ~~////~~	25
Extra Large	~~////~~ ~~////~~ ~~////~~ ~~////~~	20

TALLY-HO!



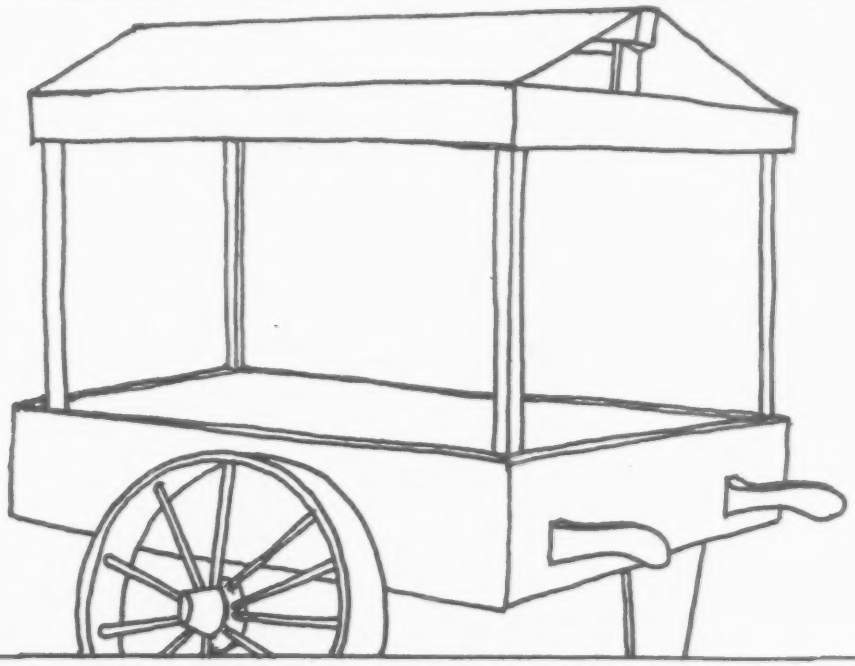
Use the information from your survey to create a bar graph of your information.

1. Check your survey tally and bar graph with your Quincy Market representative.
2. When it is approved, ask for an application for a Bull Market License.
3. Complete the license application carefully!

   Good luck!

APPLICATION FOR BULL MARKET LICENSE

Name	Homeroom number
Class Name	Teacher Name
Items to be merchandised	
Reasons for selecting above items	
Color scheme	
Name of cart	
How would the cart add to the festive spirit of the market place?	
Other information which might best describe your product and presentation	
Signature	Date



Please color in this drawing of a Bull Market cart showing the merchandise you would sell, how it would be displayed, any fixtures to be used (boxes, baskets, etc.) the method of hanging or attaching merchandise, the overall color scheme and type of sign, including the name of your cart.

STEVE'S ICE CREAM SURVEY

On a recent Tuesday afternoon Horatio took a 4 minute survey at Steve's Ice Cream Shop.

Flavor	Number of Cones Sold	Total
Cookie-O	𝍸 𝍸 //	12
Vanilla	𝍸 /	____
Oatmeal Raisin	𝍸 ///	____
Maple Walnut	////	____
Chocolate Ripple	////	____
Strawberry	//	____

Total Number of Cones Sold in Four Minutes. ☐

1. What is the ratio of Cookie-O cones to the total number of cones sold? _____

   What is the ratio of each of the other flavors to Cookie-O? _____

2. If Steve sells this many cones in 4 minutes, how many does he sell in an hour? In a 10 hour day? _____ In 5 days? _____

3. On a weekend day Steve sells twice as many cones as on a weekday. How many cones does he sell on a Saturday? _____ On a weekend?(Sat.and Sunday)_____

   How many cones will he sell in a whole week? _____

4. If it takes one gallon of ice cream to make 25 cones, how many gallons will Steve need on Tuesday?

   _____

5. If an ice cream container holds 3 1/2 gallons, how many containers must Steve order for Tuesday?

   _____

6. If you were going to order ice cream for a <u>week,</u> how many gallons would you need? _____
   How many containers would that be? _____

7. How many gallons of each flavor per **weekday** must Steve order? _____

* If each container has a diameter of 16", how much room does Steve need to store a weekday's supply? _____

Reinforcement

PORTIA PREDICTS

Portia watched what foods were being sold at Quincy Market. She learned some interesting things. Can you use her research to answer these questions?

Assume: Quincy Market is open 10 hours every day, 7 days a week.*

1. At the Taco Maker Horatio observed that 20 tacos were sold in 30 minutes. At this rate, how many tacos would be sold in ...

40 tacos in 1 hour	50 tacos in 1 1/2 hours
200 tacos in 5 hours	400 tacos in 1 day
2800 tacos in 1 week	146,000 tacos in 1 year

2. Portia was told the Pizzara Regina sells an average of 600 pizzas per day. At this rate, how many pizzas would be sold in ...

60 pizzas in 1 hour	300 pizzas in 5 hours
4200 pizzas in 1 week	219,000 pizzas in 1 year

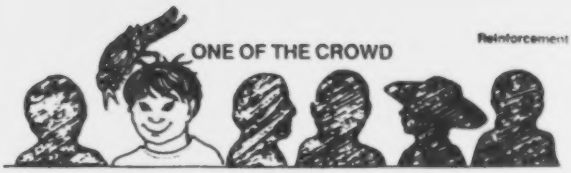
3. Horatio discovered the Boston Brownie sell 5 times as many brownies to adults as to young people, a 5 to 1 ratio. (Warning! This isn't a 1 to 5 ratio)

   1) If they sell a total of 180 brownies in 1 hour, how many were sold to adults? 150 to young people? 30

   2) How many brownies are sold in one day to adults? 1500 to young people? 300

   3) How many brownies are sold in one week to adults? 15000 to young people? 3000

* Actually, Quincy Market is only open 6 hours on Sunday but for this set of predictions assume it is open 10 hours on Sunday.



Reinforcement

ONE OF THE CROWD

HORATIO: There sure are a lot of people here at Faneuil Hall Marketplace!
CROW: About 14,000,000 people visit every year.
HORATIO: Suppose every seventh grader in my school visited Quincy Market. How many times.
CROW: Poor Horatio. He'll never solve that one. We had better help him!

Town	Est. Grade 7 Population 1986	Town	Est. Grade 7 Population 1986
Boston	4500	Waltham	450
Cambridge	500	Lincoln	125
Hingham	275	Marblehead	175
Chelmsford	425	Acton	300
Lexington	350	Medford	375
Somerville	450		

TOWN	#1 Busses	#1 Students / Busses	#2 Pizzas	#2 Students / Pizzas	#3 T-Shirts	#3 Jewelry	#3 Candy
Boston	90	5/1	1125	4/1	900	1500	3375
Cambridge	10	5/1	125	4/1	100	167	375
Hingham	6	275/6	69	275/69	55	92	206
Chelmsford	9	425/9	107	425/107	85	142	319
Lexington	7	5/1	88	175/44	70	117	263
Somerville	9	5/1	113	450/113	90	150	338
Waltham	9	5/1	113	450/113	90	150	338
Lincoln	3	125/3	32	125/32	25	42	94
Marblehead	4	175/4	44	175/44	35	58	131
Acton	6	5/1	75	5/3	60	100	225
Medford	8	375/8	94	375/94	75	125	281

Extension

THE CROWD ACCORDING TO PORTIA

PORTIA: Boy, it's certainly crowded in here!! I can hardly move.

CROW: Did you know that between twelve and fourteen million people visited Faneuil Hall Marketplace last year?

GRASSHOPPER: No! Come on!! That's more people than visited Disney World last year.

PORTIA: It's perfectly obvious it's a reasonable estimate. In the last 15 seconds, I counted 16 people coming through that door. That's 64 in a minute. Wait a minute!! Where's my calculator?? Sixty-four times...

Did Portia estimate correctly? Check her figures. yes.

3840 people/hr × 10 hrs/day × 6 days/wk × 52 wks/yr = 11,980,800 people per year.

3840 people/hr × 6 hrs/wk × 52 wks/yr = 1,198,080 people.

(Hint: The market is open every day, 10 hours a day, Monday through Saturday. On Sunday it's open 6 hours)

Extension

STEVE'S ICE CREAM SURVEY

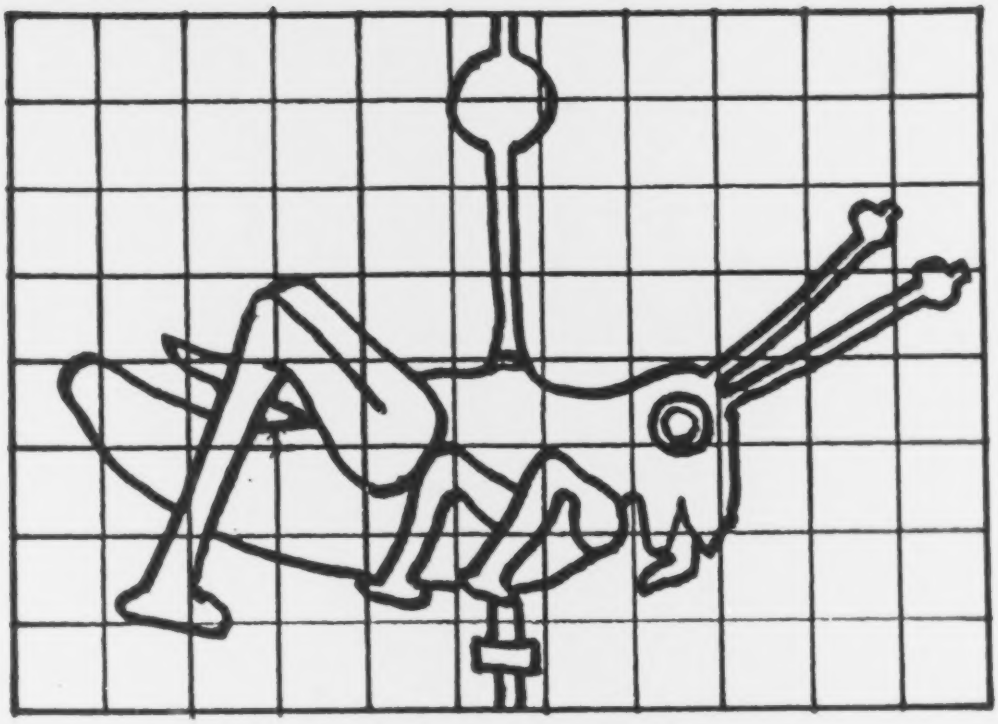
On a recent Tuesday afternoon Horatio took a 4 minute survey at Steve's Ice Cream Shop.

Flavor	Number of Cones Sold	Total
Cookie-O	𝍸 𝍸 ||	12
Vanilla	𝍸 |	6
Oatmeal Raisin	𝍸 |||	8
Maple Walnut	𝍸	4
Chocolate Ripple	𝍸	4
Strawberry	|\	2

Total Number of Cones Sold in Four Minutes: 36

1. What is the ratio of Cookie-O cones to the total number of cones sold? 1/3
   What is the ratio of each of the other flavors to Cookie-O? V:C = 1/2 · M:C = 1/3 · S:C = 1/2 · O:C = 2/3 · R:C = 1/3
2. If Steve sells this many cones in 4 minutes, how many does he sell in an hour? In a 10 hour day? 540 cones In 5 days? 27,000 cones
3. On a weekend day Steve sells twice as many cones as on a weekday. How many cones does he sell on a Saturday? 10,800 On a weekend? (Sat and Sunday) 21,600
   How many cones will he sell in a whole week? 48,600 cones
4. If it takes one gallon of ice cream to make 25 cones, how many gallons will Steve need on Tuesday? 216 gallons
5. If an ice cream container holds 3 1/2 gallons, how many containers must Steve order for Tuesday? 62 containers
6. If you were going to order ice cream for a week, how many gallons would you need? 1944 gallons
   How many containers would that be? 555 containers C:O = 72 V = 36 M = 24 C = 24 O = 48 S = 12
7. How many gallons of each flavor per weekday must Steve order?

* If each container has a diameter of 16", how much room does Steve need to store a weekday's supply? 15,872 sq. inches.



SCALE DRAWING

SCALE DRAWING OF SHOPS

Topic/Objective	Materials
Scale drawing Linear measure Perimeter, area	Graph paper, rulers Scissors, paper Direction cards (per store) Construction paper, tape Graph paper - included in packet (6 blocks per inch)

Pre-class preparation:

Review scale drawings of Quincy Market; determine scale appropriate to display area (e.g. if 9' are available, use a 1" = 6' scale); cut up cards and review them; position the outlines of Quincy Market using the dimensions listed below.

During class:

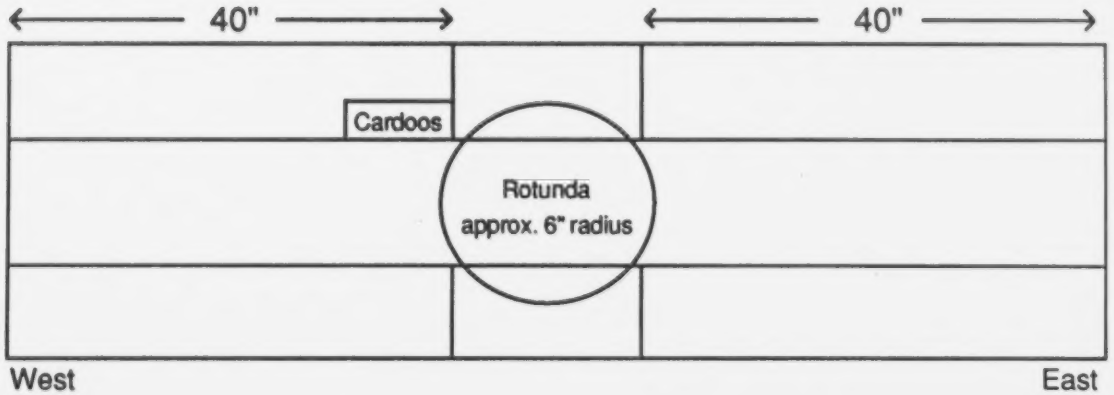
1. Use a sample card to show students how to determine the correct scaled dimensions for their shop.
   Example: Cardoos 6' x 24'
   If 1" = 6', the scaled dimensions of Cardoos would be 1" x 4".

2. Each student selects a card and computes the scaled dimensions for that store.

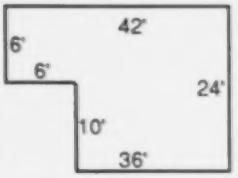
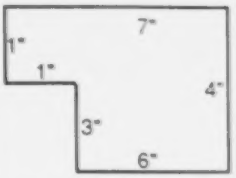
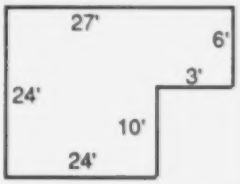
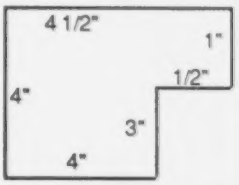
3. Then, each student draws his/her shop on graph paper using correct dimensions. Using the graph paper as a guide, students then transfer this shape onto construction paper. Each shop should be named and may be decorated if there is time.

4. Discuss the floor plan with the students. Plot the location of the sample shop. Each student locates his/her shop and positions it correctly.

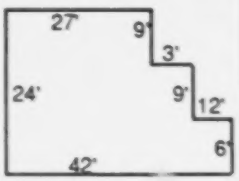
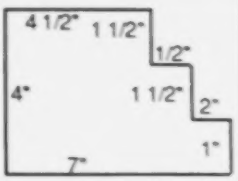
Floor Plan
Quincy Market Building



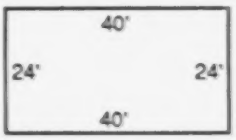
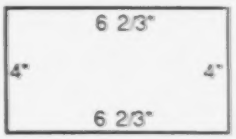
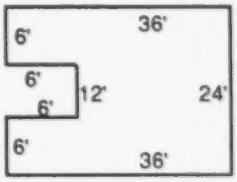
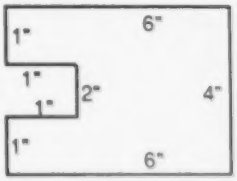
QUINCY MARKET INFORMATION SHEET

#	Name	Product	Dimensions	1" = 6' Scale
1	Coffee Connection	coffee, etc.	24' x 24'	4" x 4"
2	Beverly's Kitchen	quiches & soups	24' x 24'	4" x 4"
3	Kilvert & Forbes	cookies & brownies		
4	Paul W. Marks	cheese	24' x 18'	4" x 3"
5	Aegean Fare	Greek specialties	24' x 24'	4" x 4"
6	Pizzeria Regina	pizza	24' x 24'	4" x 4"
7	Peanut Butter Fantasies	peanut butter	24' x 21'	4" x 3 1/2"
8	J.P. Aboody	fruit cups & salads		
9	Cardoos	candy & nuts	6' x 24'	1" x 4"

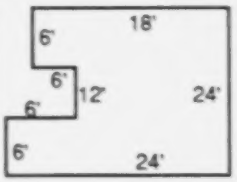
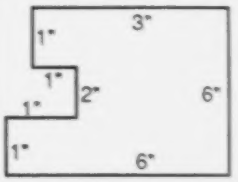
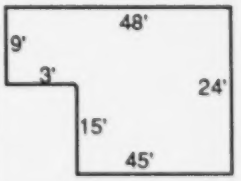
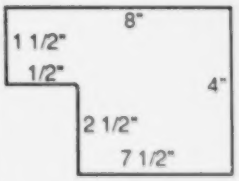
QUINCY MARKET INFORMATION SHEET

#	Name	Product	Dimensions	1" = 6' Scale
10	Joey's Gelateria	ice cream	9' x 18'	1 1/2" x 3"
11	Doe, Sullivan & Company	cheese		
12	Jennetta's	subs & Italian specialties	24' x 24'	4" x 4"
13	The Monkey Bar	drinks	24' x 18'	4" x 3"
14	Ming Tree	Chinese food	24' x 24'	4" x 4"
15	Boston & Maine Fish Co.	seafood	24' x 24'	4" x 4"
16	Great Stuff	salads	24' x 36'	4" x 6"
17	Boston Beanery	beans	9' x 9'	1 1/2" x 1 1/2"
18	Freedman's Bakery	bagels & pastries	24' x 48'	4" x 8"

QUINCY MARKET INFORMATION SHEET

#	Name	Product	Dimensions	1" = 6' Scale
19	Steve's Ice Cream	ice cream		
20	Julian's Cheesecake	cheesecake	9' x 9'	1 1/2" x 1 1/2"
21	M. Berenson	meat	24' x 39'	4" x 6 1/2"
22	E.N. West	meat	24' x 18'	4" x 3"
23	Aris Barbecue	chicken & ribs	24' x 24'	4" x 4"
24	Brown Derby Deli	hot dogs & pastrami	24' x 36'	4" x 6"
25	Au Bon Pain	French breads		
26	North End Bakery	Italian pastries	6' x 18'	1" x 3"

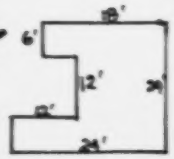
QUINCY MARKET INFORMATION SHEET

#	Name	Product	Dimensions	1" = 6' Scale
27	Aval's Fudge	fudge	6' x 12'	1" x 2"
28	Taco Maker	Mexican specialties		
29	A la Carta	hors d'oevres	24' x 24'	4" x 4"
30	Boston Brownies	brownies	24' x 18'	4" x 3"
31	The Colombo Yogurt Shop	yogurt	24' x 18'	4" x 3"
32	Walrus and the Carpenter	clams & oysters	24' x 18'	4" x 3"
33	Fisherman's Nest	fish & seafood plates	24' x 24'	4" x 4"
34	Cafe Marion	burgers & salads	24' x 39'	4" x 6 1/2"
35	Raging Cajun	gumbo & jambalaya	9' x 9'	1 1/2" x 1 1/2"
36	Carol Ann Bake Shop	Italian pastries		

28

Taco Maker

YOU MUST FIGURE THE MISSING DIMENSIONS



29

A la Carte

24' x 24'

30

Boston Brownies

24' x 18'

31

The Columbo Yogurt Shop

24' x 18'

32

Walrus and the Carpenter

24' x 18'

33

Fisherman's Net

24' x 24'

34

Cafe Marion

24' x 39'

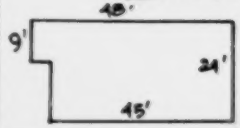
35

Raging Cajun

9' x 9'

36

Carol Ann Bake Shop



YOU MUST FIGURE THE MISSING DIMENSIONS.

QUINCY MARKET FLOOR PLAN ASSIGNMENT CARDS • EAST WING • TO BE CUT FOR STUDENTS

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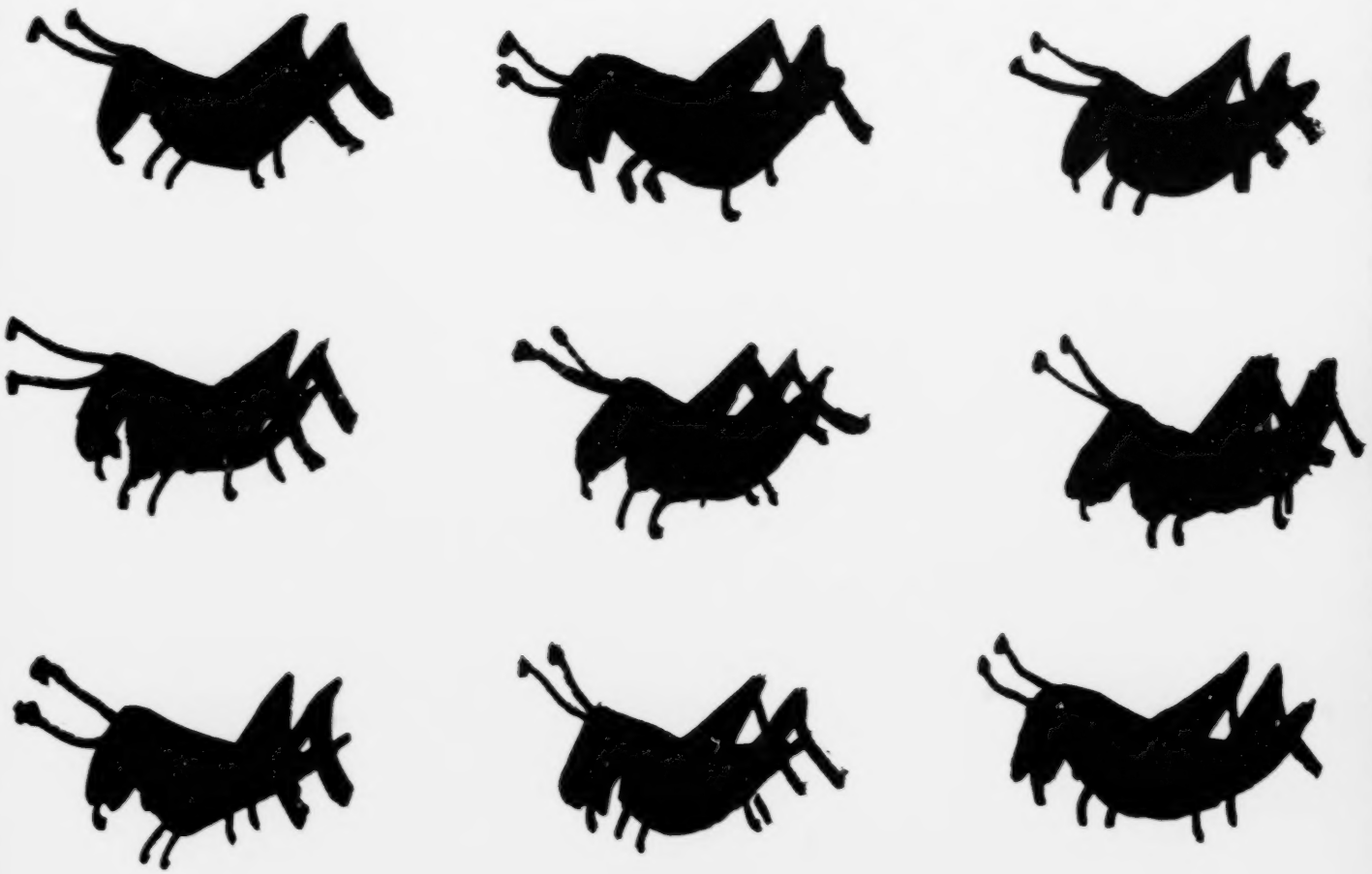
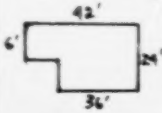
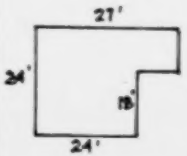


1 **The Coffee Connection** 24' x 24'	2 **Beverly's Kitchen** 24' x 24'	3 **Kilvert & Forbes**  YOU MUST FIGURE THE MISSING DIMENSIONS.
4 **Paul W. Marks** 24' x 18'	5 **Aegean Fare** 24' x 24'	6 **Pizzeria Regina** 24' x 24'
7 **Peanut Butter Fantasies** 24' x 21'	8 **J.P. Aboody**  YOU MUST FIGURE THE MISSING DIMENSIONS.	9 **Cardoos** 6' x 24'

QUINCY MARKET FLOOR PLAN ASSIGNMENT CARDS • WEST WING • TO BE CUT FOR STUDENTS

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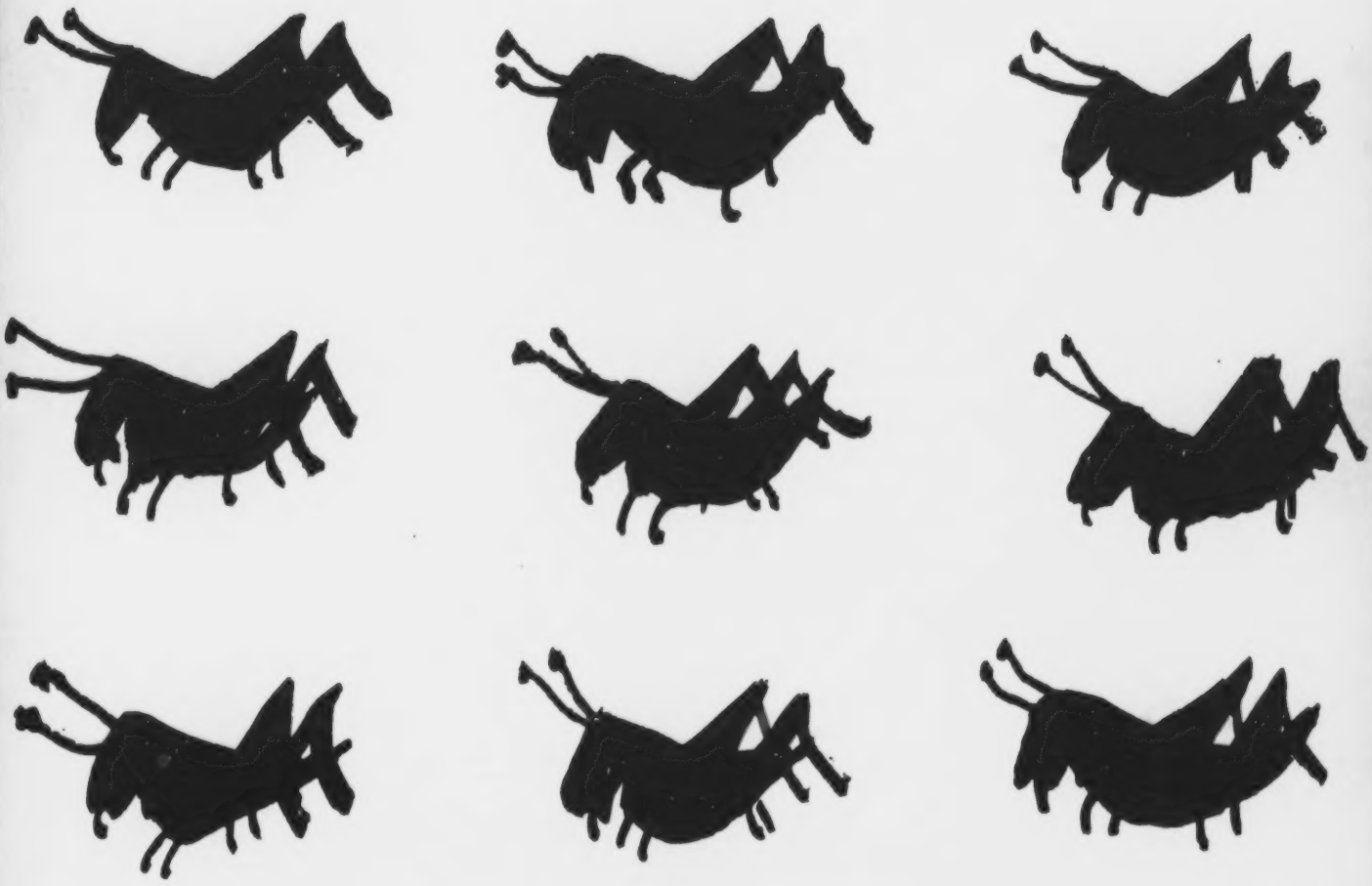
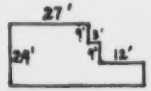


10 **Joey's Gelateria** 9' × 18'	11 **Doe, Sullivan & Co.**  YOU MUST FIGURE THE MISSING DIMENSIONS.	12 **Jennetta's** 24' × 24'
13 **The Monkey Bar** 24' × 18'	14 **Ming Tree** 24' × 24'	15 **Boston & Maine Fish Co.** 24' × 24'
17 **Boston Beanery** 9' × 9'	16 **Great Stuff** 24' × 36'	18 **Freedman's Bakery** 24 × 48'

QUINCY MARKET FLOOR PLAN ASSIGNMENT CARDS • WEST WING • TO BE CUT FOR STUDENTS

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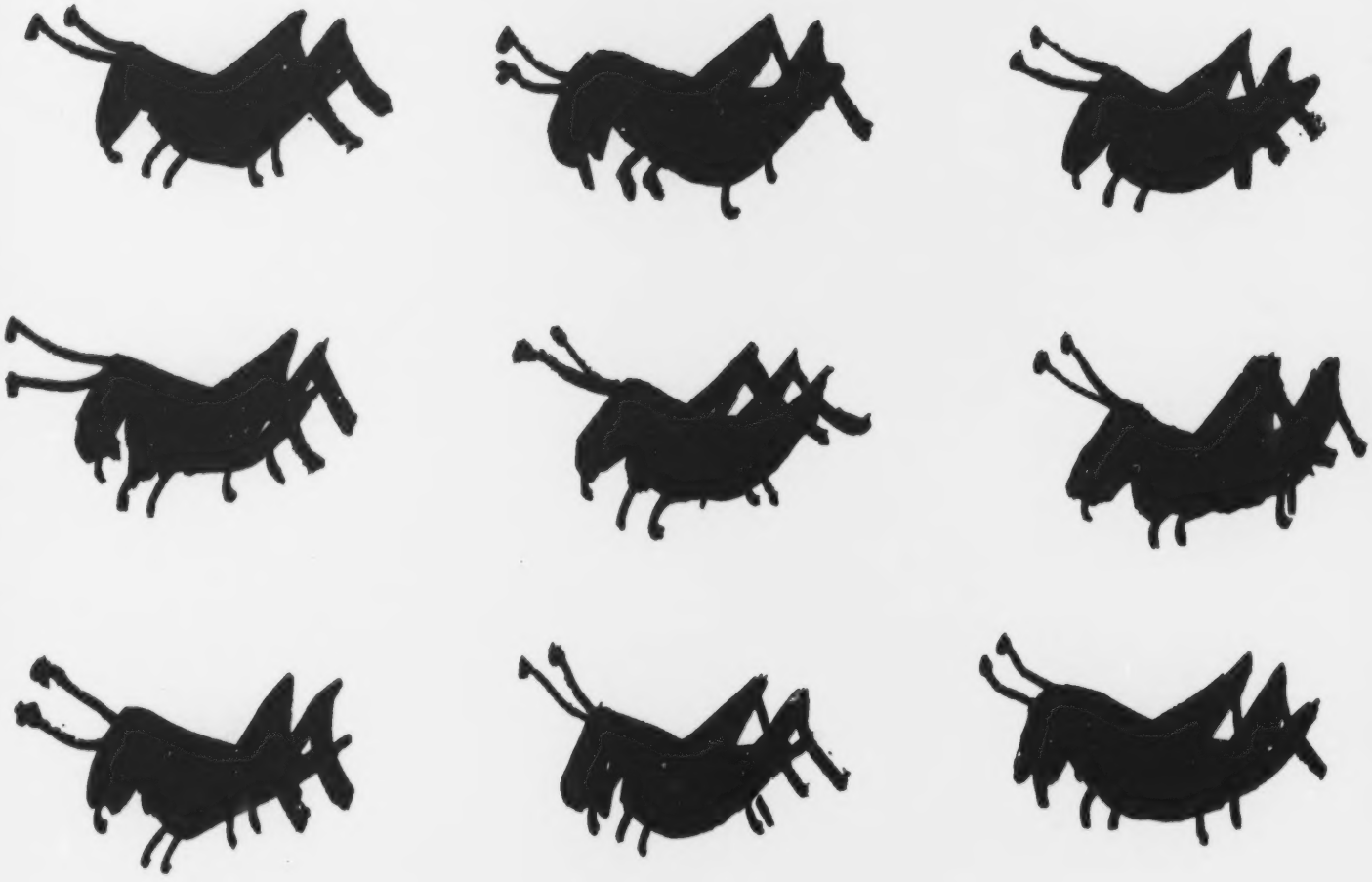
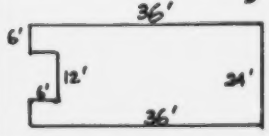
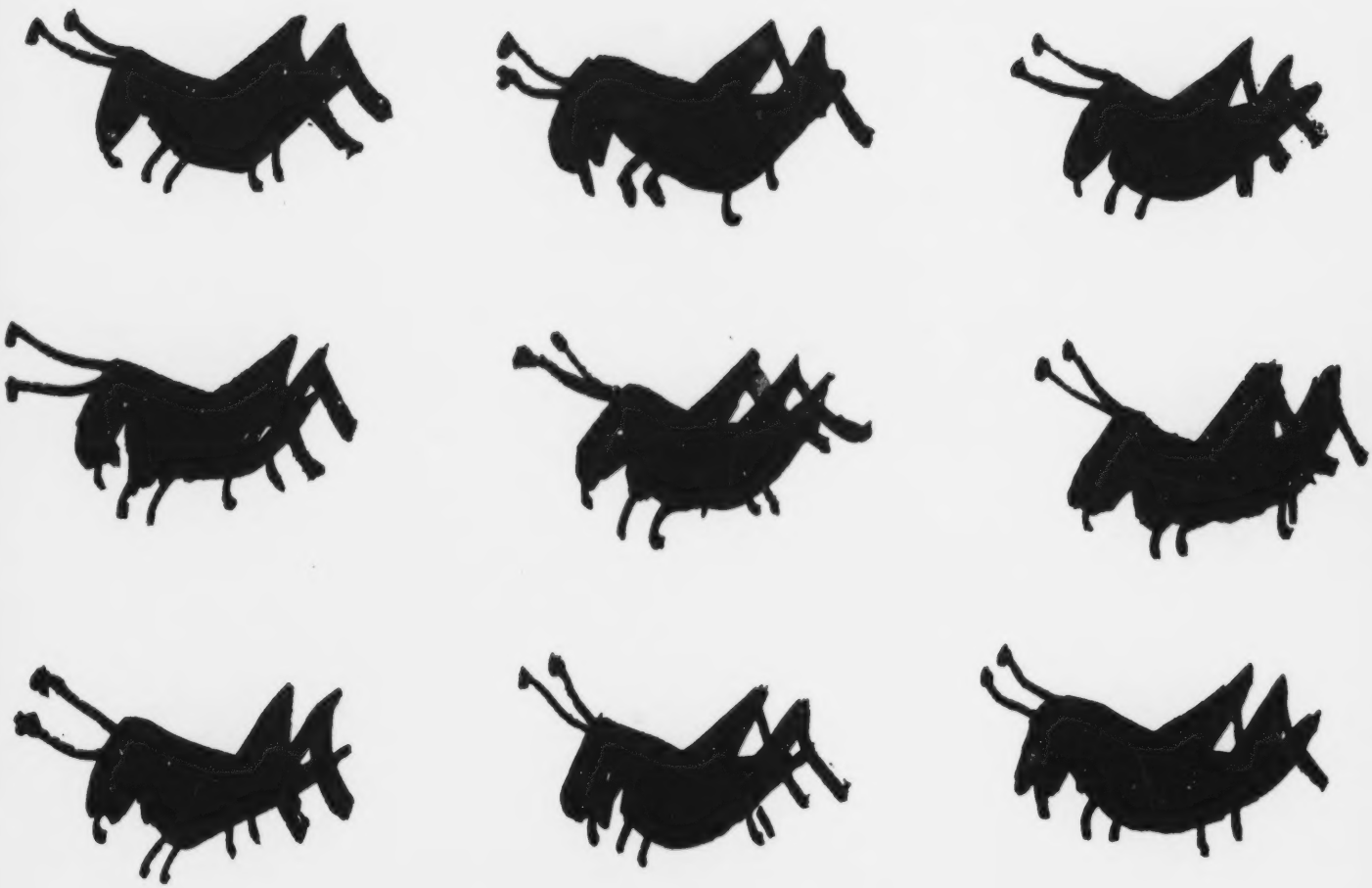
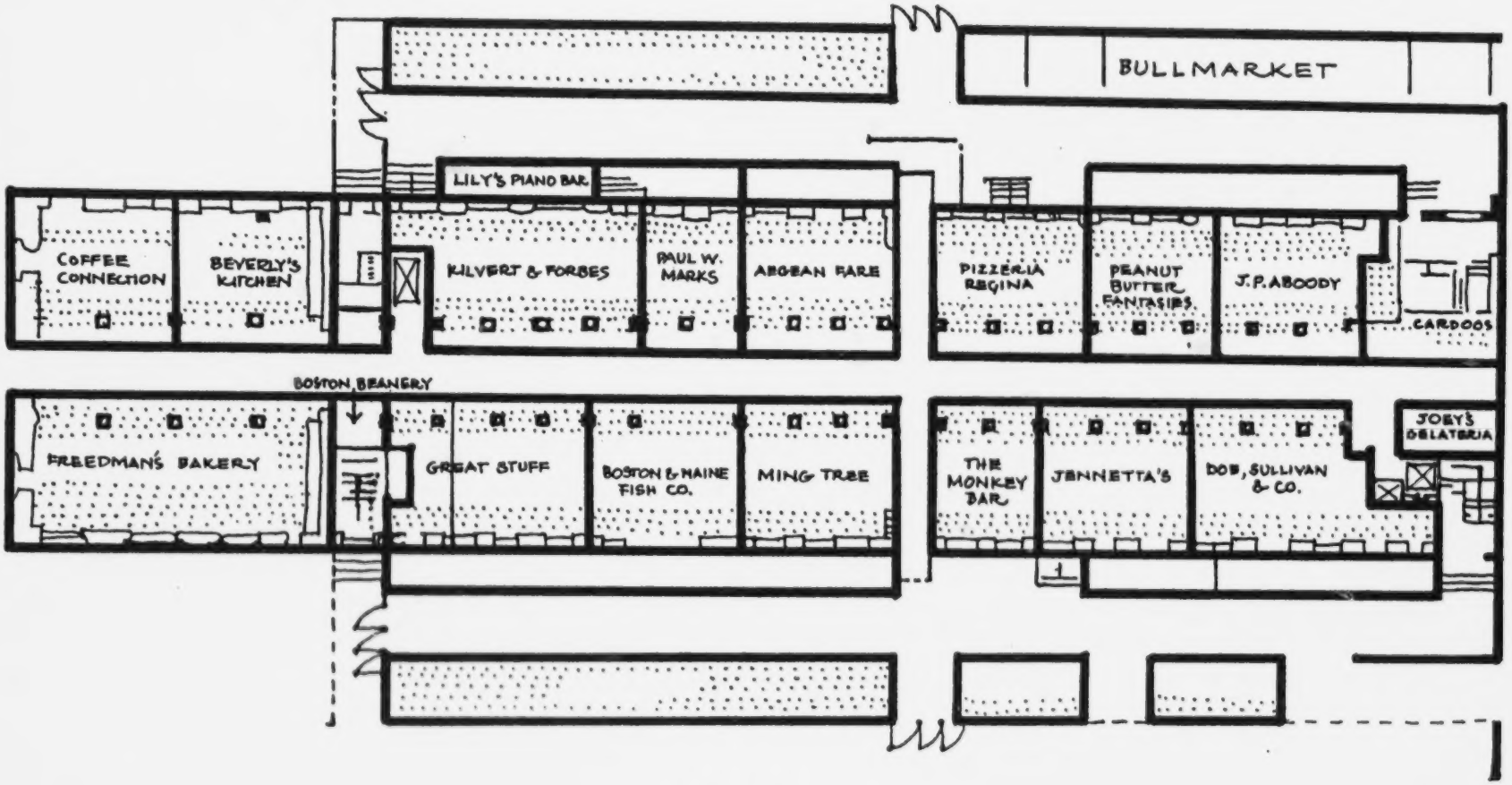


19 **Steve's Ice Cream** 24' x 48'	20 **Julian's Cheesecake** 9' x 9'	21 **M. Berenson** 24' x 39'
22 **E.N. West** 24' x 18'	23 **Aris Barbeque** 24' x 24'	24 **Brown Derby Deli** 24' x 36'
25 **Au Bon Pain**  YOU MUST FIGURE THE MISSING DIMENSIONS.	26 **North End Bakery** 6' x 18'	27 **Aval's Fudge** 6' x 12'

QUINCY MARKET FLOOR PLAN ASSIGNMENT CARDS • EAST WING • TO BE CUT FOR STUDENTS





QUINCY MARKET • WEST WING SHOP LOCATIONS

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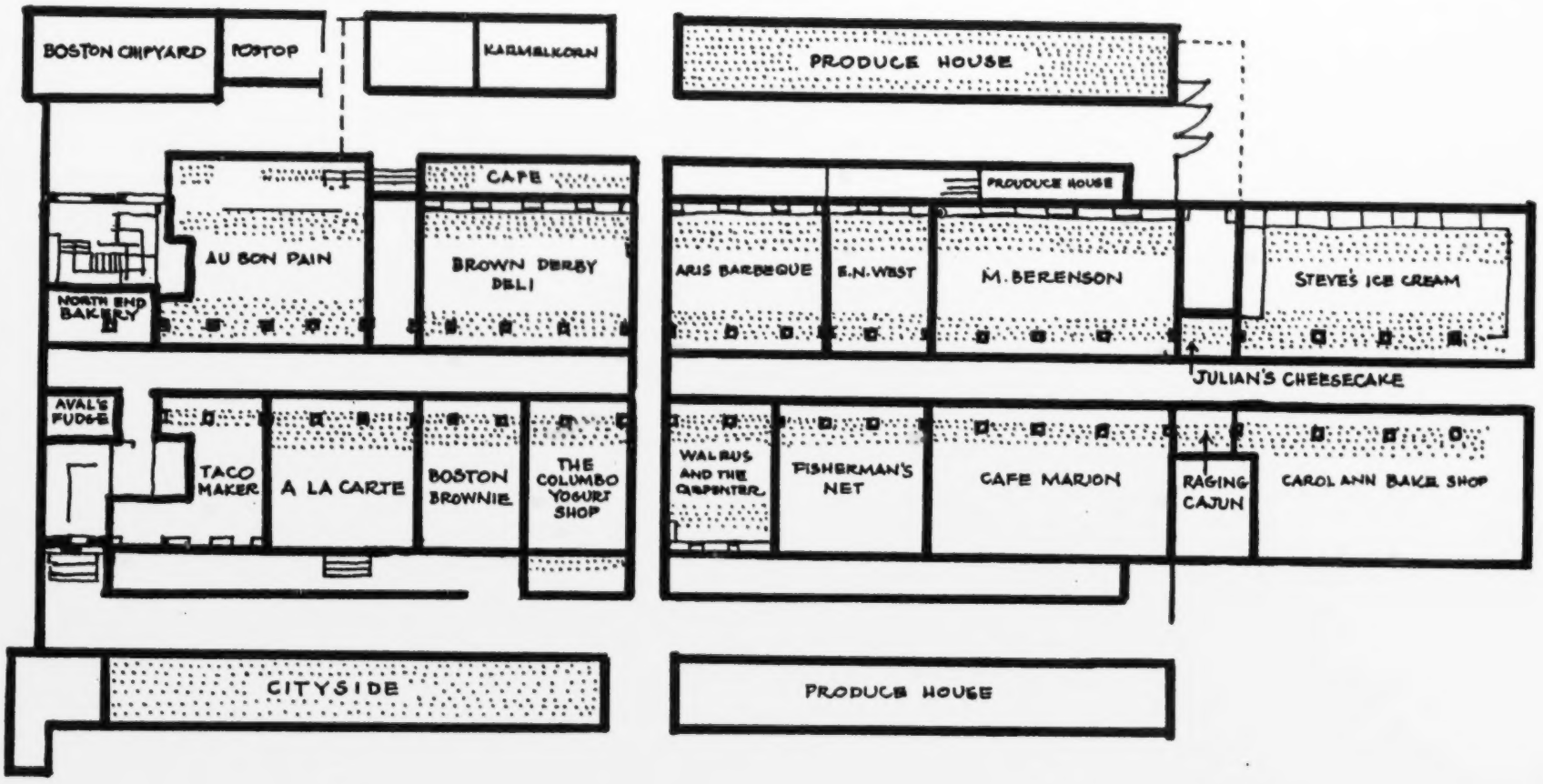
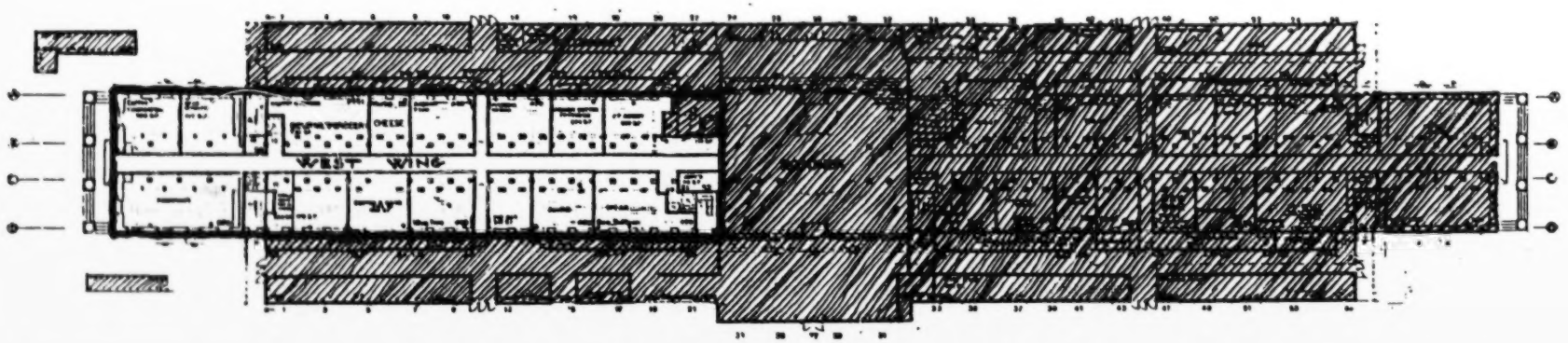


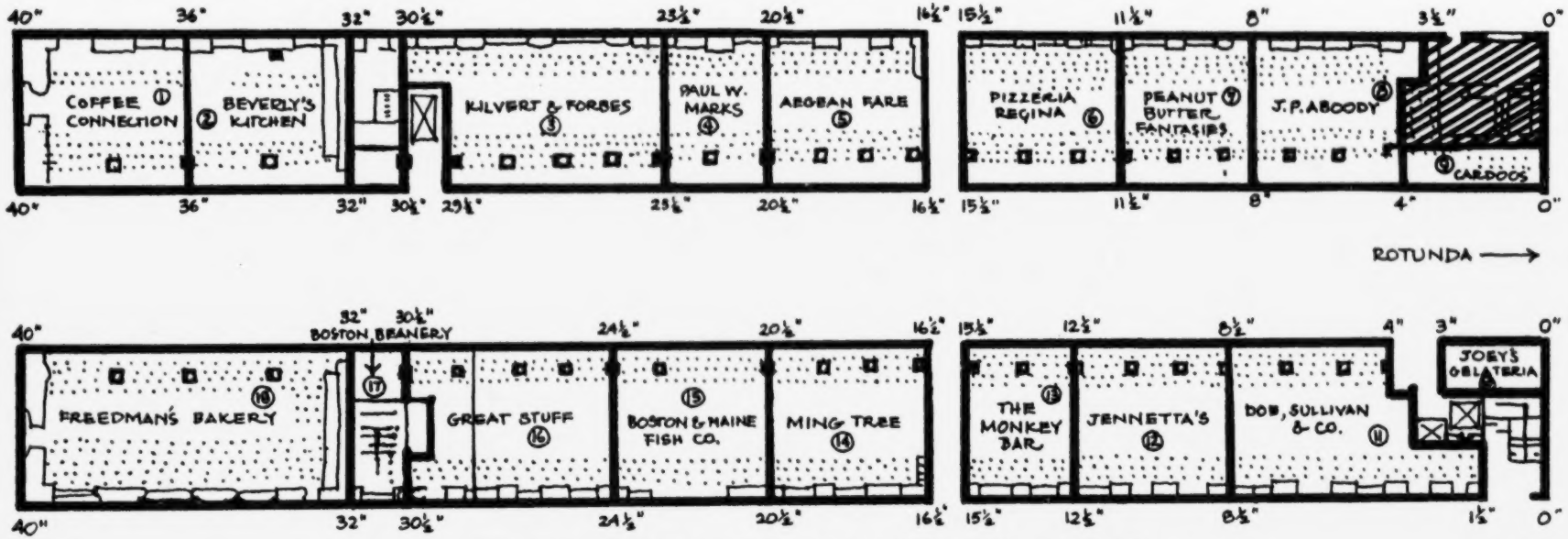
QUINCY MARKET • EAST WING SHOP LOCATIONS

QUINCY MARKET • WEST WING



FOR TEACHER USE IN GETTING UP BULLETIN BOARD DISPLAY.
INCH MARKINGS SHOULD BE MADE ON MASKING TAPE OR OTHER GUIDE ON BULLETIN BOARD.

SCALE: 1" = 6'


40" 36" 32" 30½" 23½" 20½" 16½"
COFFEE CONNECTION ①
② BEVERLY'S KITCHEN
③ KILVERT & FORBES
④ PAUL W. MARKS
⑤ AEGEAN FARE
40" 36" 32" 30½" 29½" 25½" 20½" 16½"
15½" 11½" 8" 3½" 0"
⑥ PIZZERIA REGINA
⑦ PEANUT BUTTER FANTASIES
⑧ J.P. ABOODY
⑨ CARDOS
15½" 11½" 8" 4" 0"
ROTUNDA ⟶
40" 32" 30½" 24½" 20½" 16½"
BOSTON BEANERY ⑰
⑱ FREEDMAN'S BAKERY
⑯ GREAT STUFF
⑮ BOSTON & MAINE FISH CO.
⑭ MING TREE
40" 32" 30½" 24½" 20½" 16½"
15½" 12½" 8½" 4" 3" 0"
⑬ THE MONKEY BAR
⑫ JENNETTA'S
⑪ DOB, SULLIVAN & CO.
⑩ JOEY'S OBLATERIA
15½" 12½" 8½" 1½" 0"

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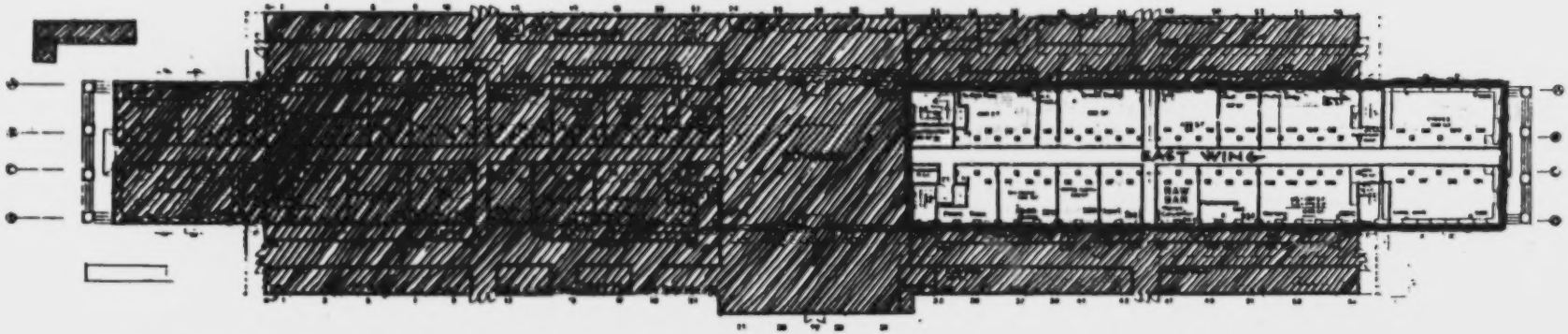
QUINCY MARKET • EAST WING



FOR TEACHER USE IN SETTING UP BULLETIN BOARD DISPLAY.
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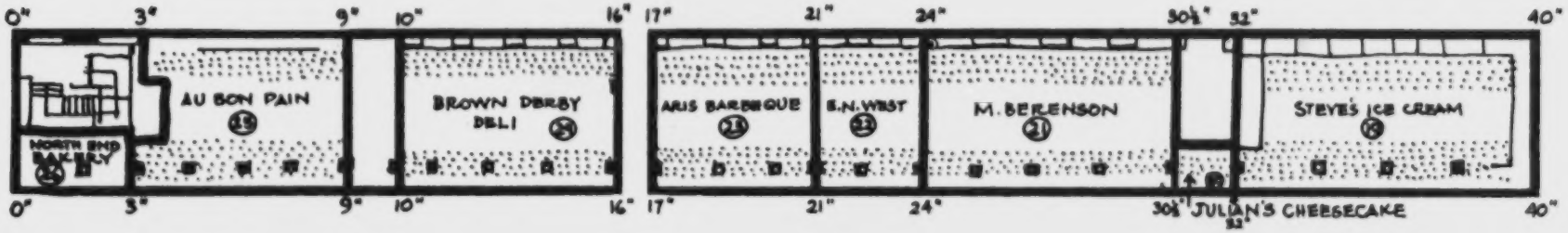
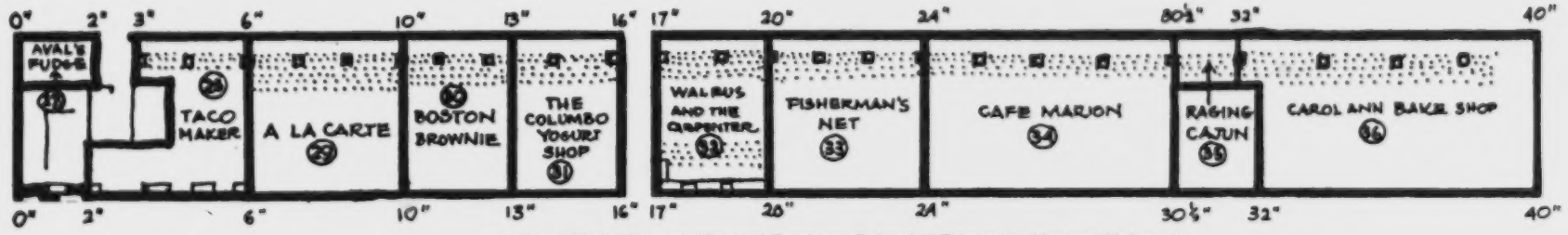


← ROTUNDA



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THE GRAPH-HOPPER

Topic/Objective	Materials
Scale drawing, linear measure Ratio, proportion Perimeter, area	Construction paper 1/2" and 1" graph paper (included in unit) Rulers

Pre-class preparation:

Prepare a sample crow, and grasshopper.

During class:

1. Ask students to choose the scale they wish to use (1/2" or 1"). Remind them that their drawings will be used as part of the class display and that a variety of sizes are needed.

2. Distribute graph paper according to scale chosen.

3. Begin a sample crow or grasshopper on the board or overhead with the class. Have students continue work on their own or in small groups. Use the coordinate system to help complete your drawings.

4. Discuss with the class the effect of scale on both the area and perimeter of a design.

Extensions:

If your classroom has floor tiles, have students complete one design on the floor using colored chalk.

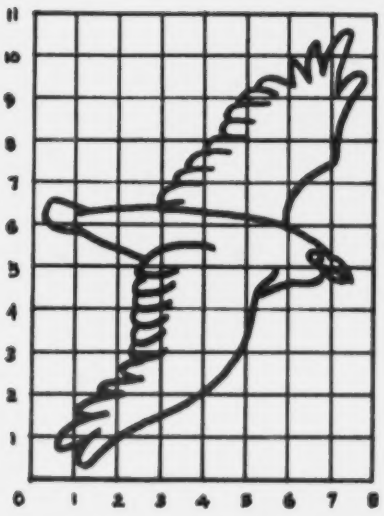
If a pantograph is available, ask a group of students to learn how to use it and present a class demonstration.

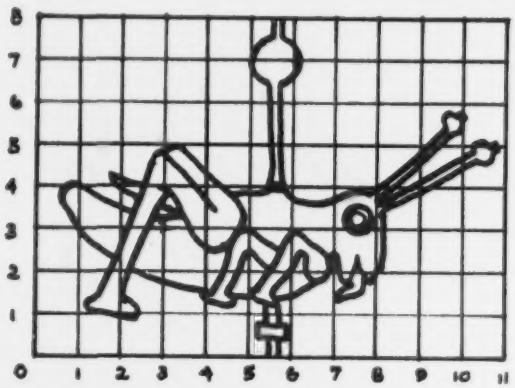
Prepare overhead transparencies from some of the designs. Project them on the wall at different distances and examine the effect on area and perimeter.

THE GRAPH-HOPPER

HORATIO: I'm trying to enlarge drawings of the crow and the grasshopper and it's not working.

PORTIA: Well, it's perfectly obvious to me that you gotta use graph paper.





The crow and grasshopper have been drawn on 1/4" graph paper.

Enlarge the pictures by using 1/2" or 1" graph paper.

Now answer the following questions:

1) What size are the squares on your graph paper? How much larger are your squares than the squares on this page? What is the perimeter of your square? Of the one above? What is the area of your square? Of the one above?

2) What do you think this enlargement will do to the length of the grasshopper or the wing span of the crow? Measure corresponding parts to check your guess.

3) What do you think this enlargement will do to the area of the paper covered by the grasshopper or the crow?

List some other questions you might ask and give their solutions.

CONSTRUCTION OF BULL MARKET CART

Topic/Objective	Materials
Scale drawing Linear measure Perimeter, Area	Posterboard or oak tag (1 1/3 pieces of 8 1/2 x 11 per cart) 1/4" metal fasteners Glue, compass, scissors

Pre-class preparation:

Construct sample cart; gather materials (posterboard or oak tag); duplicate cart design on oak tag (optional)

During class:

1. **Oak tag:** If oak tag is used and cart design has been duplicated on oak tag, students will be ready to cut and assemble their carts immediately.

   Posterboard: Instruct students to paste their designs onto the posterboard before cutting and assembling carts.

   (Students may be encouraged to work in pairs so they can assist one another)

2. After the students have assembled their carts, have them compare the dimensions of their model to those of a real cart (scale: 1" = 1')

   Suggested questions:

   What is the length of the rectangular display part of your cart?
   What will the length be on the real cart?
   What is the width of this display on your cart? On a real cart?
   What is the diameter of the model cart wheel? Of the real cart wheel?
   What is the ratio of these dimensions?
   What is the area of the model cart wheel? Of the real cart wheel?
   What is the area of the rectangular display on your cart?
   What is the area of the rectangular display on the real cart?
   What is the ratio of these two areas? Why is it different from the ratio of the length of the display areas? (the square factor is introduced)

After class

* Compare the volume of the top tray of the model cart to that of the real cart. What is the ratio of these volumes?	Extension
* Choose an item to sell from your cart. Name your cart appropriately and decorate it. You may even stock the cart. Draw all items to scale.	Extension
* Construct a full-size cart. The full-size cart is 3' by 6' (use the scale drawing to construct it). Appliance boxes (e.g. refrigerator box) would be useful. Double wheels will give added support. A roof might even be added. (Note: this introduces square and cubic factors)	Extension

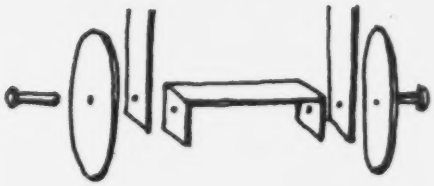
CONSTRUCT YOUR OWN BULL MARKET CART

Use the design which your teacher gives you. Follow directions for **oak tag** or **posterboard** depending on the material you are using.

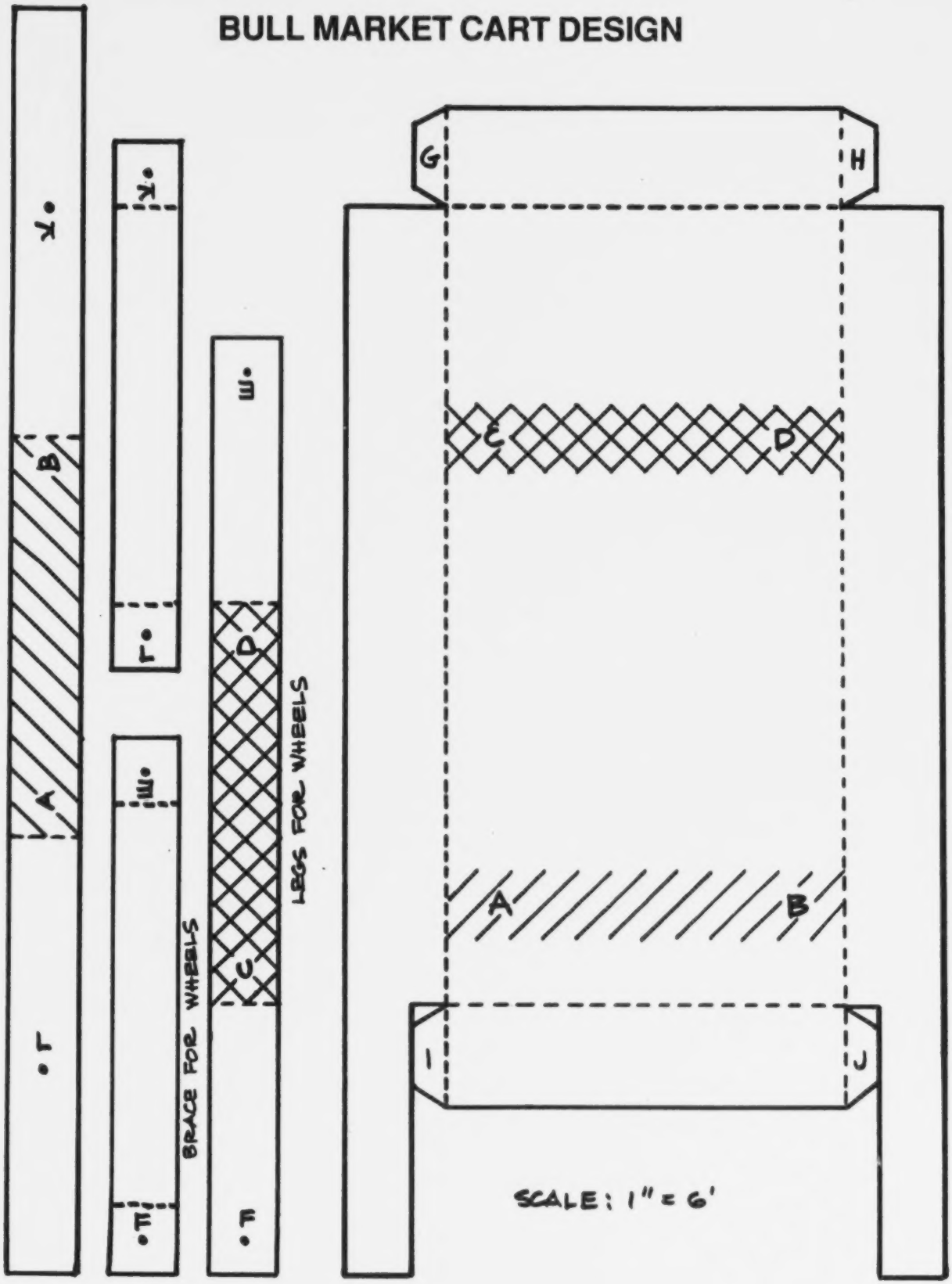
OAK TAG: Skip to step 1 below.

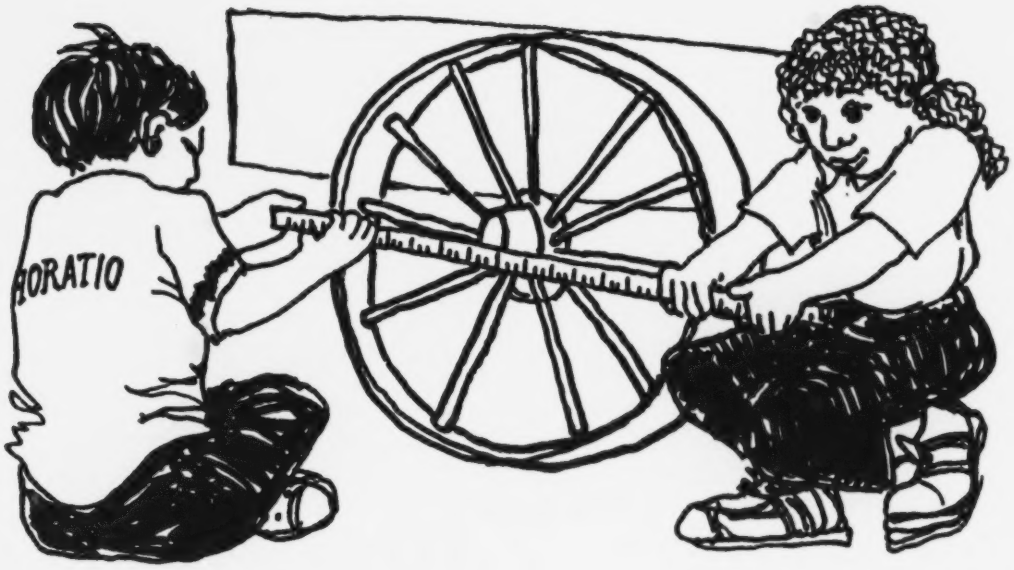
POSTERBOARD: Using a ruler and ball point pen, trace the design from the paper onto the posterboard. Press hard. Now go to step 1 below.

1. Carefully cut all pieces along solid lines.
2. Use a compass to construct two circles with diameters of 3" on your plain piece of oak tag. Cut out these circles for cart wheels.
3. Fold carefully on dotted lines. Dots should be on the outside of the fold.
4. Glue AB to AB and CD to CD.
5. Fold in tabs G, H, I and J and glue to form the top of the cart.
6. Insert a small metal fastener into the center of one wheel, then through point F on the cart leg and point F on the brace, and fasten. (Be sure that the brace tab is inside the leg cart with the tab facing down.)
7. Insert another fastener through the center of the other wheel, then through point E on the other leg and finally through point E on the brace.
8. With glue, attach the other leg brace, matching K's and L's.



BULL MARKET CART DESIGN





PERIMETER AND AREA

PERIMETER

Topic/Objective	Materials Needed
Concept of perimeter	12.5 feet of yarn knotted at 12 feet, graph paper, 2 yardsticks, dot paper for all students

During class:

1. Ask four students to hold the yarn and be prepared to create different shapes. Ask two students to check measurements with yardstick. All other students should record figures on dot paper or graph paper. Use scale 1" = 1' or 1/4" = 1'.

2. Ask the students to form the following using the yarn (all of the perimeters will be the same since the length of the yarn never changes):

   - a triangle
   - an equilateral triangle--discuss the meaning of congruence
   - a right triangle--how many different right triangles can be formed? Does one of the right triangles have sides 3, 4, and 5? (remind students that the perimeter is constant)
   - a square
   - a rectangle--how many different rectangles can you form? What is the perimeter of each? What is the area of each? What rectangle appears to have the largest area?
   - What does perimeter mean? If I know the perimeter of a figure, can I always predict the area?

After Class

"I Counted My Hops!" Reinforcement
Use textbook for supplementary problems

I COUNTED MY HOPS

Horatio: How far is it around the Quincy Market building?

Grasshopper: I didn't really measure, but I counted my 242 hops.

If every grasshopper hop is 60 inches long, what is the perimeter of the Quincy Market Building in feet?

_____
perimeter

Horatio: I didn't really measure, but I took 24 steps when I walked along the width of the building.

If every step Horatio took was 25" long, what was the width of the building in feet?

_____
width

Using the information from the Grasshopper and Horatio, find the dimensions of the Quincy Market Building.

(Hint: Draw a diagram of a rectangle to help you solve the puzzle.)

HANDS AROUND THE SCHOOL

Topic/Objective	Materials Needed
Concept of perimeter	Town Map (optional)

During class:

1. Ask students to stand around the perimeter of the room (or the lunchroom or gymnasium--wherever there is blank wall space).
   - Can they enclose the entire perimeter?
   - Can they enclose the perimeter with fewer people?
   - Estimate and agree upon the length for which each person is responsible
   - Estimate the largest perimeter that this class could form

2. Can you predict whether all of the students in the school could surround the school building? The gym? The football field? Your town?

3. Did you know that most people are "squares"? ("squares" means that the ratio of their arm spread to their height is close to 1).

   Check this with:
   - Members of your class
   - Small children
   - Adults

4. Using an enlarged map of your town have students use yarn to measure the perimeter and convert this answer to feet. Calculate the number of people required to surround the town. Could your town's population do this?

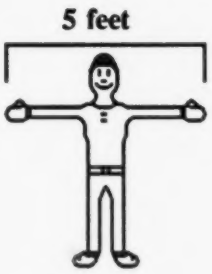
5. (Challenge Project) "Hands Across America" tried to create a human chain from New York to Los Angeles. If it is 2825 miles, how many students would be necessary for the chain.

After Class

"Quincy Market, We've Got You Surrounded" Extension
"Portia's Dilemna" Extension

QUINCY MARKET: WE'VE GOT YOU SURROUNDED!

Fact: The Quincy Market building is 555' long and 50' wide. The average person has an arm spread of 5 feet.

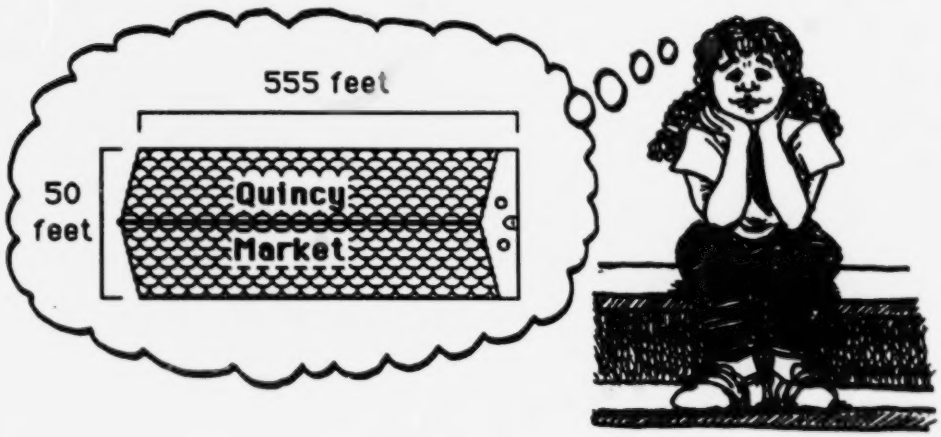


Question: How many visitors would it take to surround Quincy Market?

Fact: Approximately 35,000 people visit Quincy Market every day.

Question: If all of the visitors on Tuesday held hands, how many times would Quincy Market be surrounded?

PORTIA'S DILEMMA



Fact: One day Quincy Market had 34,364 visitors. Every visitor had a 5' arm spread. Suppose every visitor was there at the same time, and they all joined hands around the outside of Quincy Market.

Question: What is the largest (in area) rectangle that can be formed that uses <u>every</u> visitor and has dimensions proportional to those of Quincy Market?

AREA: SQUARES AND RECTANGLES

Topic/Objective	Materials
Develop concept of area	Use Masking tape to mark 4 square feet and 1 square yard on the floor. Place the tape so that one square is 2 feet on a side and the other is 3 feet on a side

During Class:

1. Ask one student to stand in the 4 square-foot box. Can another student fit? How many can fit? (Rule: Both feet must be on the floor)

2. Have students stand in the square yard box. How many can fit?

3. What is the ratio of the number of students in the 4 square-foot box to the number of students in the square yard box?

   Use these numbers for the following problems and the homework assignment.

4. Have students estimate the number of students who could fit in
   -the classroom
   -the gym, etc.

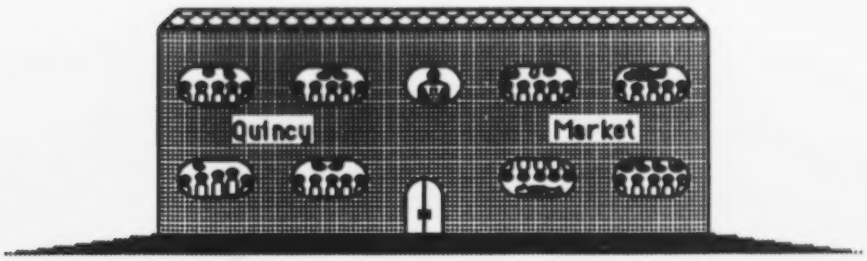
5. How many square feet (yards) would hold the entire class?

6. How many square feet (yards) would hold the entire school?

After Class

"How Many Visitors Can Fit in Quincy Market?" Reinforcement
"Bull Market Cart Storage" Extension
Use textbook for supplementary problems

HOW MANY VISITORS CAN FIT INTO THE QUINCY MARKET BUILDING?

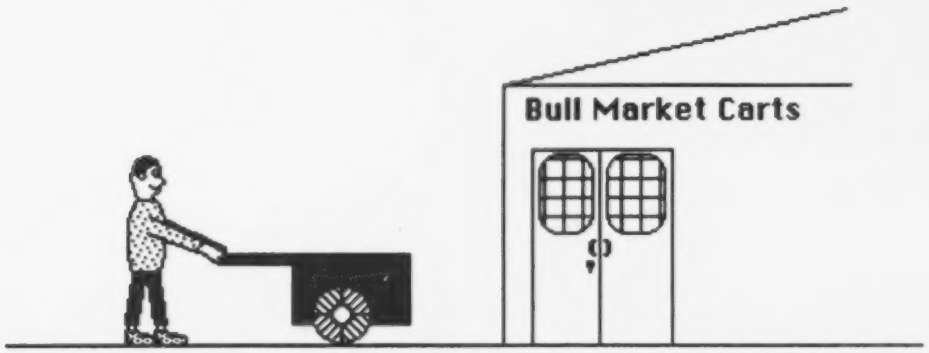


The dimensions of the Quincy Market Building are 50' by 555'. If we assume there are no obstacles in the building, how many people can fit inside the building at one time? First floor only, please! (HINT: Use the results from your class experiment and think about the number of people that fit into a square yard).

Find out about the fire regulations for your town and what limits there are on building capacity. How many people could <u>legally</u> fit into Quincy Market if it were in your town?

Use the results of your class experiment to determine how many people could fit into an elevator 5' x 6'. If the average weight of each person is 130 lbs., how much weight is that elevator carrying?

BULL MARKET CART STORAGE



Bull Market carts are 3' wide and 6' long. If there are 50 carts that must be stored in a room, find the dimensions of the smallest room that will hold all 50 carts. The room should only have one door (which opens out). You decide where that door should be. The carts must be placed so that any cart can get out without moving other carts.

Show the arrangement of the carts in the room.

HINTS: Graph paper might help. You may choose to use the carts you have constructed and start with a smaller number of carts.

SPOT ON THE WHEEL

Topic/Objective	Materials
Circumference of a circle Concept of π	String, Rulers, Calculator, Chart on blackboard (optional), Tape Measure (optional)

Pre-Class Preparation: Cut-out cardboard circles with diameters of 3", 4", 5", 10", and 12"
Put chart below on blackboard.

Diameter of Wheel	Measure of Circumference	$\frac{C}{D}$
3 inches		
4 inches		
5 inches		
10 inches		
12 inches		

During Class:

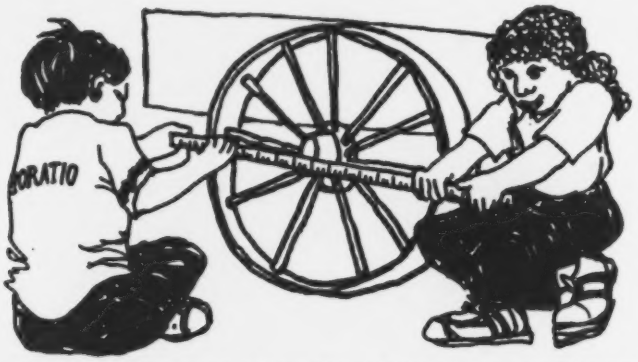
1. Explain that the word circumference is used to designate the perimeter of a circle.
2. Ask students to find a diameter (by folding circle in half) and to measure and record the diameter and circumference (using string or rolling circle on a flat surface).
3. Have students make a visual comparison of circumference and its relationship to diameter.
4. Encourage them to verbalize that for any circle the circumference is approximately three times the diamter.
5. Use the chart on the blackboard and a calculator to develop $C/D \approx 3.14$ and introduce the symbol π. Stress that 3.14 is an approximation and that the formula $C = \pi D$ may be used to find the circumference of a circle with known diameter.
6. Have students make up several examples using the formula and "Spot on the Wheel" in class. Have students share the examples with each other.

After Class

"Spot on the Wheel"	Reinforcement
"Pi for Horatio"	Reinforcement
"How Many Rotations"	Extension
Use textbook for supplementary examples	

THE SPOT ON THE WHEEL

Horatio observes a nick on the edge of the wheel as one of the vendors pushed a bull market cart into position.



HORATIO: I wonder how far the cart moves when the wheel turns exactly once?

PORTIA: It's perfectly obvious to me that we need to measure the circumference of the wheel and compare our measure, in some way, to the diameter of the wheel.

HORATIO: Circumference!! What's that?

PORTIA: Circumference is the perimeter of the wheel.

Portia and Horatio did some measurement and put the results on a chart. Complete the chart by finding the indicated measurements and doing the necessary calculations. (HINT: A calculator could make this easier).

Find 5 other circular objects to measure and complete the chart.

OBJECT	DIAMETER	DISTANCE AROUND OUTSIDE OF CIRCLE (circumference)	Divide circumference by diameter and round answer to nearest hundredth
WHEEL	3 feet	9.5 feet	3.17
PIZZA			
CHOCOLATE CHIP COOKIE			

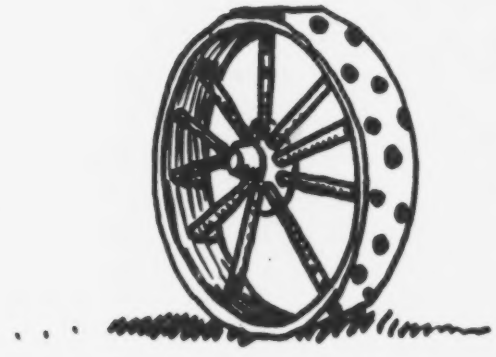
What do you observe in the last column? What are your conclusions?

MORE SPOTS ON THE WHEEL

OBJECT	DIAMETER	DISTANCE AROUND OUTSIDE OF CIRCLE (CIRCUMFERENCE)	$\frac{\text{CIRCUMFERENCE}}{\text{DIAMETER}}$ ROUND ANSWER TO NEAREST HUNDREDTH
WHEEL	5 FEET	15.9 FEET	3.18

What do you observe in the last column?

What are your conclusions?



PI FOR HORATIO

ππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππ

PORTIA: Horatio, it's perfectly obvious to me you don't need to measure the circumference, just multiply the diameter by π!

HORATIO: Apple or blueberry?

ππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππππ

Poor Horatio! He still thinks π = **apple**, but you know π = **3.14** (well, almost!). Find the circumference of the following using the formula **C = πd**.

1. A cup with a diameter 4". _____
2. The top rim of a flower pot with diameter 6". _____
3. The bottom rim of a lampshade with diameter 12". What is your answer in inches?_____ In feet? _____
4. A circular rug with diameter 54". What is your answer in inches?_____ In feet?_____ In yards?_____
5. A circular swimming pool with diameter 18'. What is your answer in feet?_____ In yards?_____
6. A button with diameter 1/2". What is your answer in inches?_____
7. A bicycle wheel with radius 13". How many inches have you travelled when the wheel makes one rotation?_____
8. Estimate the diameter of a pipe with circumference 9 1/2". _____

Measure the circumference of 3 circular objects and use the formula C = πd to estimate the diameter of these objects.

OBJECT	CIRCUMFERENCE	DIAMETER
1.		
2.		
3.		

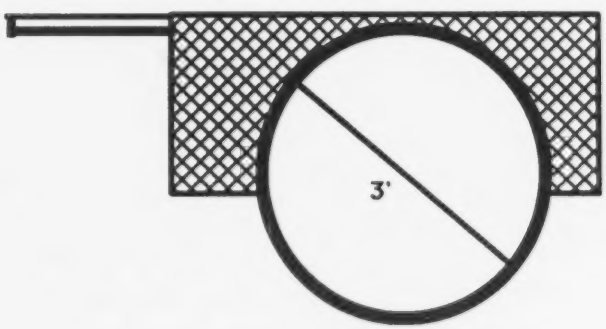
HOW MANY ROTATIONS, HORATIO?

HORATIO: I think I'll push this cart around Quincy Market and count the number of times the wheel turns.

CROW: Remember, Horatio, the Quincy Market building is 50 feet wide and 555 feet long.

GRASSHOPPER: An estimation is good enough for me!

PORTIA: Does anybody have a calculator?



Find out how many times the wheel turns when the bullmarket cart is pushed around the perimeter of the Quincy Market building.

Why might Horatio's answer be different from Portia's?

Are there any accuracy problems here?

A BIG SLICE IN THE LIFE OF HORATIO

Topic/Objective	Materials
Area of circle (estimation)	Graph chalkboard, 1" graph paper (3 pieces per student), Compasses, String (2 feet)

During Class:

1. Distribute graph paper and compasses to each student.
2. Brainstorm with students to generate methods for approximating the area of a circle.
3. Have students draw a circle with radius 3" on their graph paper and count the squares. (Approximate partially covered squares.)
4. Repeat same procedure with circles of 1" and 2" radius.
5. Draw circles of radius 4" on chalkboard. Ask students to brainstorm how they would use their graph paper to find the area of this circle. (Hint: students should draw semicircle on graph paper.)
6. Introduce "A Big Slice in the the Life of Horatio".

   Discuss meaning of a 16" pizza. (Hint: radius = 8")

   Show students how to draw a circle using string. Suggest that students draw their circles on newspaper or a brown paper bag. Have students use their graph paper for estimating area.

After Class

"A Big Slice in the Life of Horatio" Reinforcement

A BIG SLICE IN THE LIFE OF HORATIO

HORATIO: I'm starved! I want a large 16" pizza.

PORTIA : That's more than twice the size of the 10" pizza! You'll never finish all that, Horatio!

HORATIO: It's only 6" bigger!

Portia and Horatio are not using the same type of comparison. **BOTH ARE RIGHT!** Can you explain why?

Construct circles of diameter 10" and 16" and estimate carefully the area of each circle. Bring your circles to class and be prepared to explain your method of estimation.

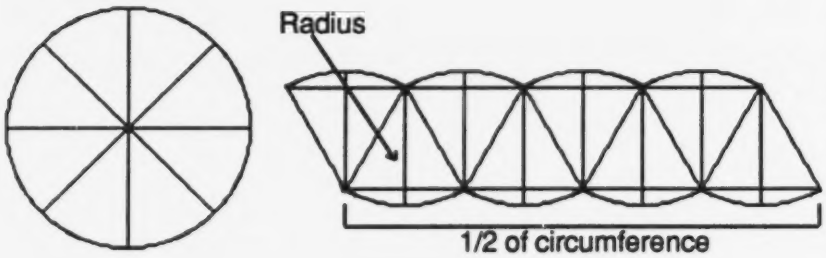
PIZZA PI

Topic/Objective	Materials
Area of Circle (formula)	Scissors Rulers

During Class:

1. Discuss methods used by students to approximate the area in "A Big Slice in the Life of Horatio".

2. Use the parallelogram method to help students vizualize the area of a circle.



For a parallelogram:

Area = (base) x (height)

Area = (1/2)Cr

Area = (1/2) (πd) r

Area = (1/2) π (2r) r

Area = πr^2

3. Have the students cut the circle into eight equal slices and form a parallelogram. This intuitive approach leads to the actual formula.

4. Use the formula to calculate the area of the 10 and 16 inch pizzas. Compare the results with previous estimations.

5. Have students solve additional examples. Stress the meaning of r^2.

After Class	
Textbook examples using formula	Reinforcement

ROOM UNDER THE UMBRELLA

Topic/Objective	Materials
Area of Circle	Square yard marked on floor 36" diameter circle on floor (use masking tape to outline shapes on floor)

During Class:

1. Determine how many students can stand in a square yard or in a 36" circle.
2. Have students form groups to solve "Room Under the Umbrella". (Teacher may have to brainstorm or suggest possible approaches, diagram, etc.)
3. Ask students why we used a square yard and a 36" circle in our comparison.

After Class:	
"All Wet"	Reinforcement
Text book problems using πr^2	Reinforcement
"Room Under the Umbrella"	Extension

ROOM UNDER THE UMBRELLA

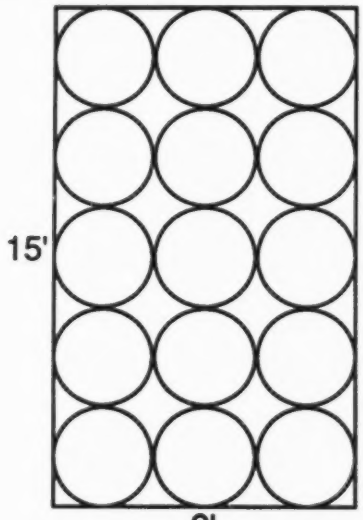
Horatio: Even in that crowd of people with umbrellas, I GOT WET!

Crow: Look at the facts, Horatio.

1. How many people can stand in a square yard?

2. How many people can stand under an umbrella that is 36" in diameter?

Use a rectangle 15' by 9' as an example and estimate the number of people that get wet.



Think! What happens if we change the size of the rectangle to 8' by 5' or the diameter of the umbrella to 40"?

Make up some other umbrella problems.

Reinforcement

I COUNTED MY HOPS

Horatio: How far is it around the Quincy Market building?

Grasshopper: I didn't really measure, but I counted my 242 hops.

If every grasshopper hop is 60 inches long, what is the perimeter of the Quincy Market Building in feet?

1210 feet
perimeter

Horatio: I didn't really measure, but I took 24 steps when I walked along the width of the building.

If every step Horatio took was 25" long, what was the width of the building in feet?

600 inches = 50 feet
width

Using the information from the Grasshopper and Horatio, find the dimensions of the Quincy Market Building.

(Hint: Draw a diagram of a rectangle to help you solve the puzzle.)

555 feet X 50 feet

Reinforcement

QUINCY MARKET: WE'VE GOT YOU SURROUNDED!

Fact: The Quincy Market building is 555' long and 50' wide. The average person has an arm spread of 5 feet.

Question: How many visitors would it take to surround Quincy Market?

242 people

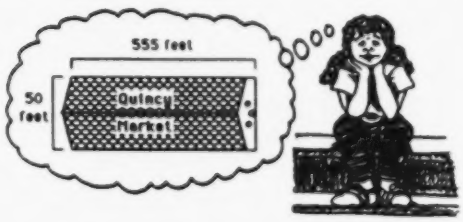
Fact: Approximately 35,000 people visit Quincy Market every day.

Question: If all of the visitors on Tuesday held hands, how many times would Quincy Market be surrounded?

145 times

Extension

PORTIA'S DILEMMA



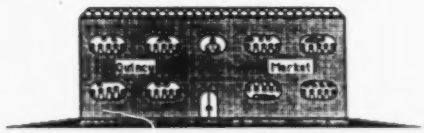
Fact: One day Quincy Market had 34,364 visitors. Every visitor had a 5' arm spread. Suppose every visitor was there at the same time, and they all joined hands around the outside of Quincy Market.

Question: What is the largest (in area) rectangle that can be formed that uses <u>every</u> visitor and has dimensions proportional to those of Quincy Market?

length of human wall = 78,810 ft.
width of human wall = 7100 ft.
Area = 559,551,000 sq. ft ≈ 560,000,000

Reinforcement

HOW MANY VISITORS CAN FIT INTO THE QUINCY MARKET BUILDING?



The dimensions of the Quincy Market Building are 50' by 555'. If we assume there are no obstacles in the building, how many people can fit inside the building at one time? First floor only, please! (HINT: Use the results from your class experiment and think about the number of people that fit into a square yard).

3083 sq. yds. X _____ $\frac{\text{people}}{\text{sq. yard}}$ = _____ people

Find out about the fire regulations for your town and what limits there are on building capacity. How many people could <u>legally</u> fit into Quincy Market if it were in your town?

Use the results of your class experiment to determine how many people could fit into an elevator 5' x 6'. If the average weight of each person is 130 lbs., how much weight is that elevator carrying?

3.3 sq. yds. x _____ $\frac{\text{people}}{\text{sq. yard}}$ X 130 lbs. = _____ lb

Reinforcement

PI FOR HORATIO

PORTIA: Horatio, it's perfectly obvious to me you don't need to measure the circumference, just multiply the diameter by π!

HORATIO: Apple or blueberry?

Poor Horatio! He still thinks π = apple, but you know π = 3.14 (well, almost!). Find the circumference of the following using the formula C = πd.

1. A cup with a diameter 4". 12.56"
2. The top rim of a flower pot with diameter 6". 18.84"
3. The bottom rim of a lampshade with diameter 12". What is your answer in inches? 37.68" In feet? 3.14'
4. A circular rug with diameter 54". What is your answer in inches? 169.56" In feet? 14.13' In yards? 4.71 yds.
5. A circular swimming pool with diameter 18'. What is your answer in feet? 56.52' In yards? 18.84 yds.
6. A button with diameter 1/2". What is your answer in inches? 1.57"
7. A bicycle wheel with radius 13". How many inches have you travelled when the wheel makes one rotation? 81.64"
8. Estimate the diameter of a pipe with circumference 9 1/2". 3"

Measure the circumference of 3 circular objects and use the formula C = πd to estimate the diameter of these objects.

OBJECT	CIRCUMFERENCE	DIAMETER
1.		
2.		
3.		

Extension

HOW MANY ROTATIONS, HORATIO?

HORATIO: I think I'll push this cart around Quincy Market and count the number of times the wheel turns.

CROW: Remember, Horatio, the Quincy Market building is 50 feet wide and 555 feet long.

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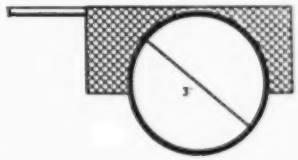

Find out how many times the wheel turns when the bullmarket cart is pushed around the perimeter of the Quincy Market building.

128.5 rotations

Why might Horatio's answer be different from Portia's?

Are there any accuracy problems here? VARIATIONS FROM THE PATH HORATIO TAKES, IE. HOW CLOSE TO THE BUILDING.

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Extension

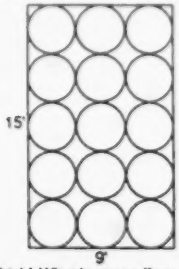
ROOM UNDER THE UMBRELLA

Horatio: Even in that crowd of people with umbrellas, I GOT WET!

Crow: Look at the facts, Horatio.

1. How many people can stand in a square yard?
2. How many people can stand under an umbrella that is 36" in diameter?

Use a rectangle 15' by 9' as an example and estimate the number of people that get wet.



15 people get wet assuming 5 people per sq. yd. and 4 people per umbrella.

Think! What happens if we change the size of the rectangle to 8' by 5' or the diameter of the umbrella to 40"?

Make up some other umbrella problems.

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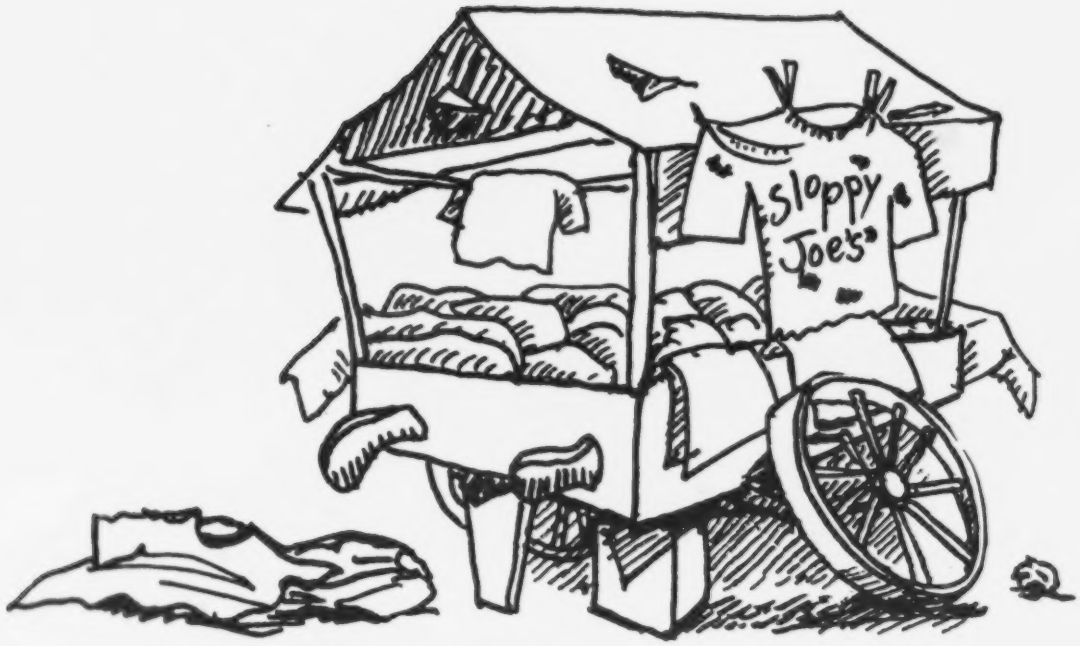


SIMULATION

BUSINESS SIMULATIONS

Topic/Objective	Materials Needed
Problem Solving Percent of a number	For Bull Market Game Bull Market Cards Bull Market Score Sheets (6 per student) For Computer Simulation Any Apple II Computer T-Stop Saleogram Disk (included in unit)

Before Class:

Decide whether to use the Bull Market Game or the Computer Simulation or both.

The Bull Market Game is a simplified simulation of running a T-Stop cart. Each student maintains his/her own records and performs the calulations as the teacher presents each card. Students may also work in small groups. This activity can be used for two or more class periods.

T-Stop Sales is a computer simulation which will run on any Apple II computer. Students can work in small groups to run a cart and try to beat Sloppy Joe, a lazy but successful business person. This activity also can be used for two or more class periods.

BULL MARKET GAME

Materials Needed: Green Bull Market cards 5 1/2" x 4 1/4", Bull Market scoresheet

DIRECTIONS: This game is based on the BULL MARKET at Quincy Market. The score sheet presents a one week simplified simulation of a T-shirt cart. The game may be used by an entire class, small groups or individually. Since directions on some cards vary, based on the price of T-shirts and the placement of the cart inside or outside, several students could use the same five cards for a week but have different profits.

1. Shuffle the deck of cards and put them face down.
2. Fill in your name on the score sheet and fill in the starting amount. This should be $3,000 at the beginning of **WEEK #1** and the profit or loss carried over for any other week. Also, note all carts pay a $20.00 storage fee each week.
3. Choose inside or outside position for your cart for the week and enter the appropriate amount.
4. Order the number of T-shirts to keep the stock at 600. Your price per T-shirt is $4.00.
5. Choose a selling price from **$10.00** to **$15.00** for the T-shirts for the **first** day of the week.
6. Take the top card in the pack and write the % (up or down) in the appropriate column. Calculate the number of T-shirts sold based on a normal day of 60 shirts sold.

e.g.,	Sales up 10%	60 + 6	Sales down 85%	60 - 45
	10% of 60 is 6	66	85% of 60 is 45	15

7. Put the number of T-shirts sold for the day in the appropriate blank and calculate the total sales for the day.
8. Choose a price for T-shirts for the next day. Continue the same process for the week.
9. At the end of the week find the total number of shirts sold for the week.
10. Find the total sales for the week.
11. To calculate total profit for the first week subtract the $3,000 you started with from the total sales. Carry this amount to the start of the next week.

NOTE: Don't forget at the beginning of each week to readjust your T-shirt order to keep inventory at 600.

BULL MARKET SCORESHEET

WEEK# _____ NAME _____

STARTING AMOUNT $ _____
(This should be $3,000 for the first week.)

Inside ($275) or Outside ($150) —$ _____

Storage ($20.00) —$ _____

Order _____ T-shirts at $4.00 each —$ _____

CASH ON HAND $ _____

	PRICE OF T-SHIRTS	TAKE CARD % UP OR DOWN	T-SHIRTS SOLD	TOTAL SALES FOR DAY
SUNDAY				
MONDAY				
TUESDAY				
WEDNESDAY				
THURSDAY				
FRIDAY				
SATURDAY				
TOTALS FOR WEEK				

Balance $ _____

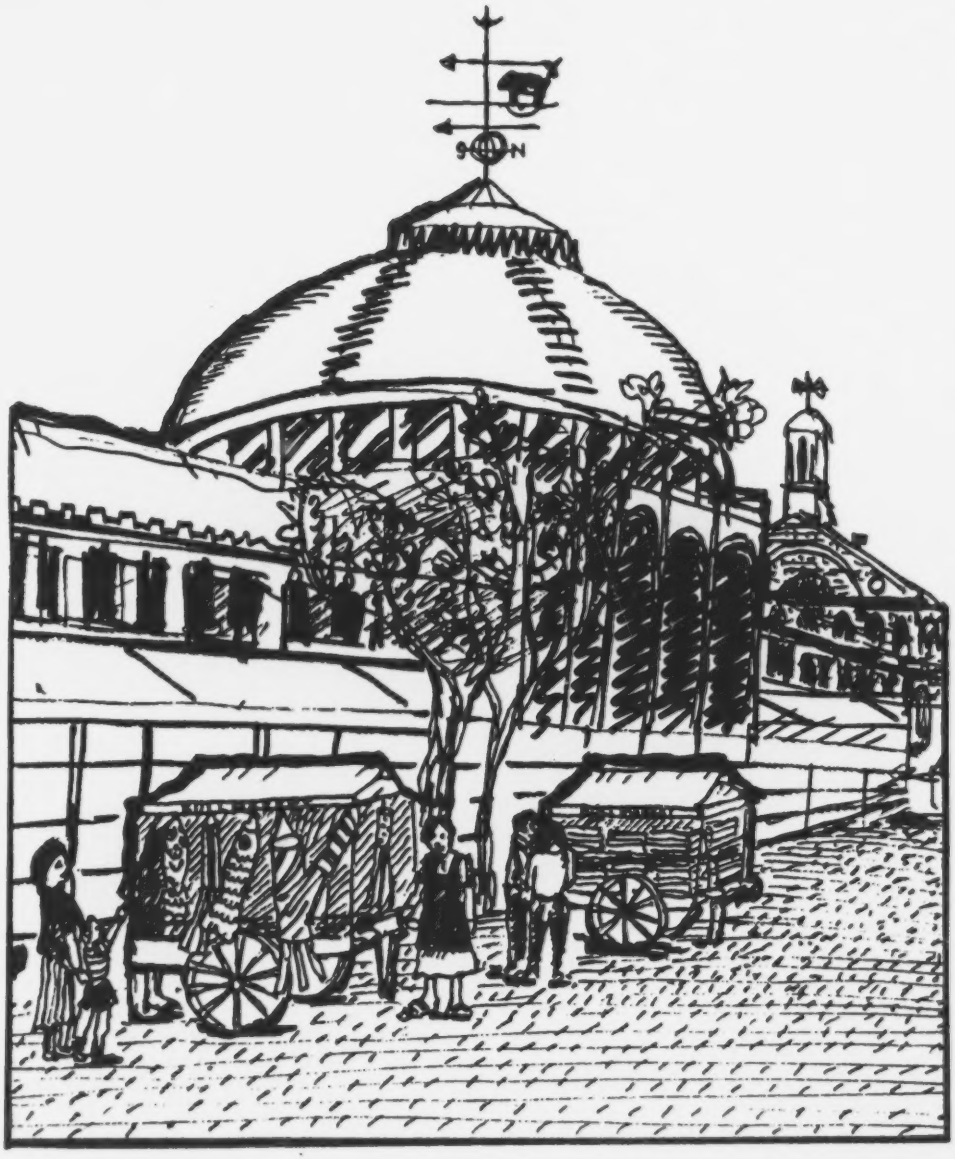
T - STOP SALES
Computer Simulation

T-Stop Sales is a computer simulation which will run on any Apple II computer. The program simulates the sale of T-shirts at a Bull Market cart for 1 month. Students run their cart in competition with Sloppy Joe's T-shirts. Sloppy Joe is a lazy businessperson who always orders the same number of T-shirts and never changes his prices.

The goal of the game is to beat Sloppy Joe by ordering and pricing carefully. Students use problem solving strategies and accurate math calculations to win the game.

GRAND FINALE

Finish Horatio and Portia's story.



TEACHER RESOURCES

RESOURCES

MATERIAL	ADDRESS	TELEPHONE NUMBER
T-Aid Map	MBTA Customer Service 10 Park Plaza Boston, MA 02116	617-722-3200
Official Massachusetts Transportation Map	Public Information Office Mass. Dept. of Public Works 10 Park Plaza Boston, MA 02116-3973	617-973-7500
Teachers' Guide to Faneuil Hall (People and Places)	Boston National Historic Parks 15 State Street Boston, MA 02109	617-223-2982
History of Measurement	Ford Motor Company The American Road PO Box 1899 Dearborn, MI 48121	
Brochure on Quincy Market	Faneuil Hall	617-223-6098

CITY/TOWN STATISTICS

Town/City	1985 Population	Sq. Miles Land and Water Area	Median Family Income	Means of Transportation	Grade 7 Population	Grade 8 Population
Acton	17,431	10.14	$31,607	Lowell RTA	300	309
Boston	625,000 (est)	45.40	$16,062	MBTA Hudson	4,489	4,397
Cambridge	95,362	7.14	$17,845	MBTA	515	559
Chelmsford	30,684	22.96	$28,174	Lowell RTA	414	453
Hingham	20,648	22.59	$30,157	MBTA P and B	273	307
Lexington	29,224	16.63	$34,989	MBTA Grayline	347	376
Lincoln	6,902	14.92	$31,543	MBTA	120	95
Malden	52,474	5.13	$19,814	MBTA	431	483
Marblehead	19,403	4.42	$29,167	MBTA	167	203
Medford		8.76	$21,441	MBTA Hudson	373	357
Newton	82,925	18.33	$30,436	MBTA Suburban	651	736
Revere	39,512	6.32	$19,004	MBTA	403	413
Somerville	71,134	4.32	$18,220	MBTA	465	483
Waltham	57,955	13.52	$22,335	MBTA	462	458
Weymouth	53,735	17.72	$22,693	MBTA	593	608

QUINCY MARKET DATA

Steve's Ice Cream

Most popular flavors:
1. Cookie-O
2. Oatmeal Raisin
3. Vanilla and Chocolate

Least popular:
1. Nuts
2. Butter Pecan

The most popular flavors sell at a 5 to 1 ratio to the least popular flavors.

They sell 110 pieces (3 1/2 gallons each) on weekends vs. 60 pieces on weekdays.

Raging Cajun

1. Jambalaya	($4.50 lg., $2.50 sm.)
2. Gumbo	(least popular)

Jamalaya to Gumbo 60 to 20

Aris Barbecue

1. 1/4 pounder cheesburgers to jumbo hotdogs	4 to 1
2. Fried onion rings to jumbo hot dogs	5 to 1

Boston Brownies

Adult preferences:

German Chocolate	vs.	Butterscotch	5 to 1
		Boston's Best	4 to 3

Young people:

M&M Brownies	vs.	Double Deck	Even

Adult customers outnumber youngsters 5 to 1, and about 1000 brownies are sold per day.

The Taco Maker

1. Taco	400 per day
2. Burrito	250 per day
3. Tostado	50 per day

Root Beer to Diet Coke 10 to 1

QUINCY MARKET DATA

Cardoos (candy and nuts)

Gummi "bears", "worms", "strawberries", "fish", "shells"	vs. Gumballs	3 to 1
	vs. Sugar Daddy's	20 to 1
	vs. Shoelace Licorice	3 to 1

Pizzeria Regina

Cheese vs. Pepperoni 3 to 1

Whole Pizzas:

Pepperoni	to Mushroom	4 to 1
	to Anchovy	20 to 1

They sell about 600 pizzas per day.

Ming Tree

#10 Combination Plate vs. #3 (chow mein, fr. rice & chicken fingers) 3 to 1

Appetizers:

1. Teryaki sticks
2. Chicken Wings
3. Shrimp and Egg Rolls (less popular)

Teryaki to Egg Rolls 2 to 1

SUPER CHALLENGES!!

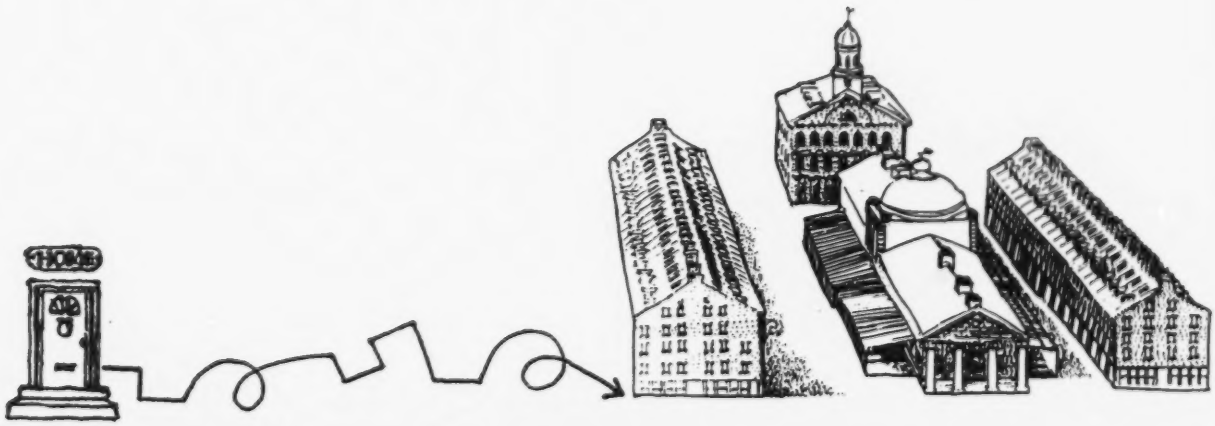
1. How big is 1,000,000? How can you communicate this to someone else?

2. You run a T-shirt cart and must make some decisions concerning staffing, pricing, etc. How can you gain maximum profit?
   - -What are the patterns of sales--when are they heavy, light?
   - -When does the line of customers require a second salesperson?
   - -What should the price of T-shirts be to minimize change and maximize a desirable sounding price?

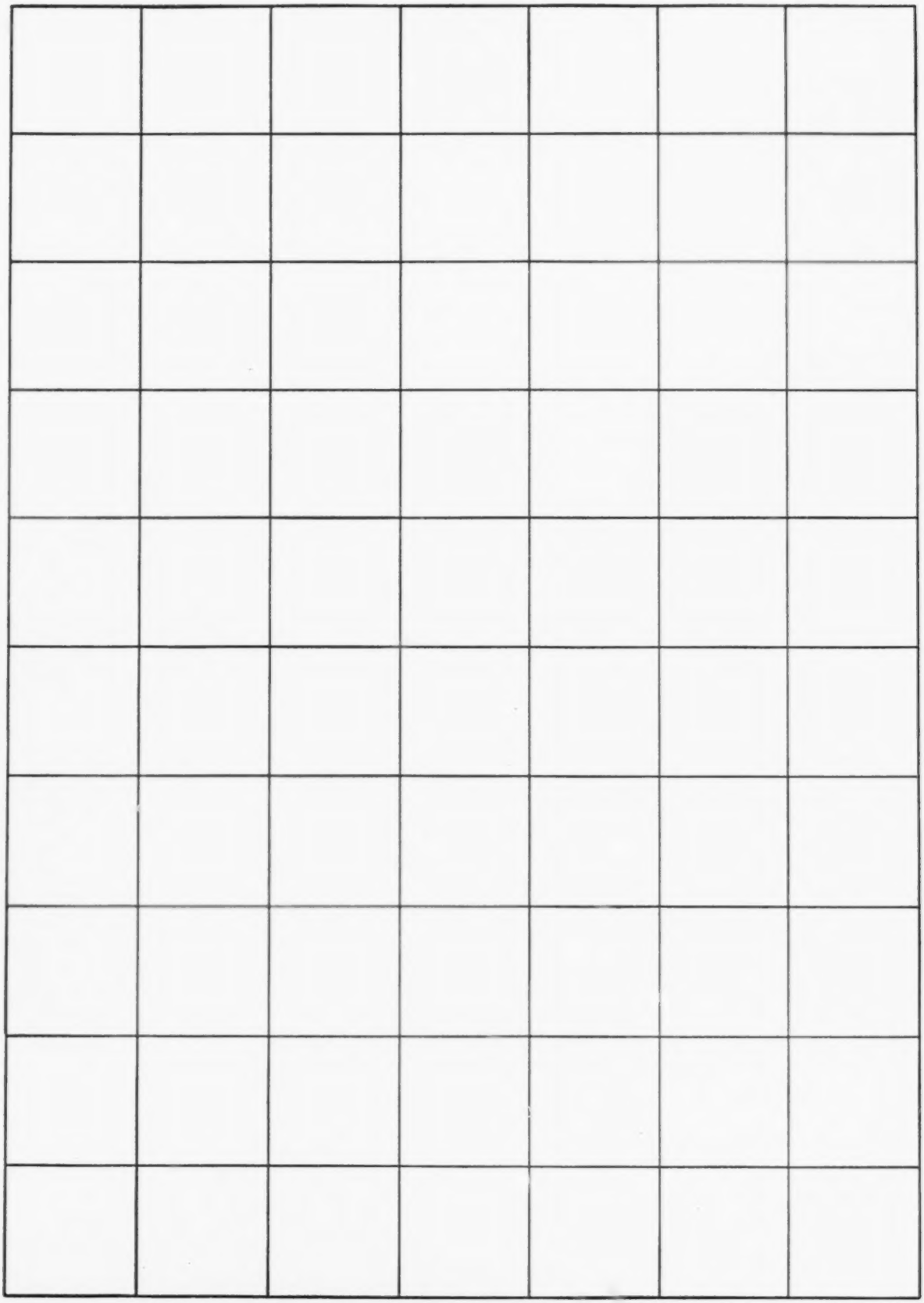
3. What is the "best" route from your home to Quincy Market? How do you define "best"? (Some ideas: minimum average time, most reasonably consistent time, traffic patterns, etc.)

4. Design a parking garage for Quincy Market.

5. What is the best location for a T-shirt cart in Quincy Market?
   - -Should it be inside or outside?
   - -How crowded should the area be?
   - -What other stands should it be near?

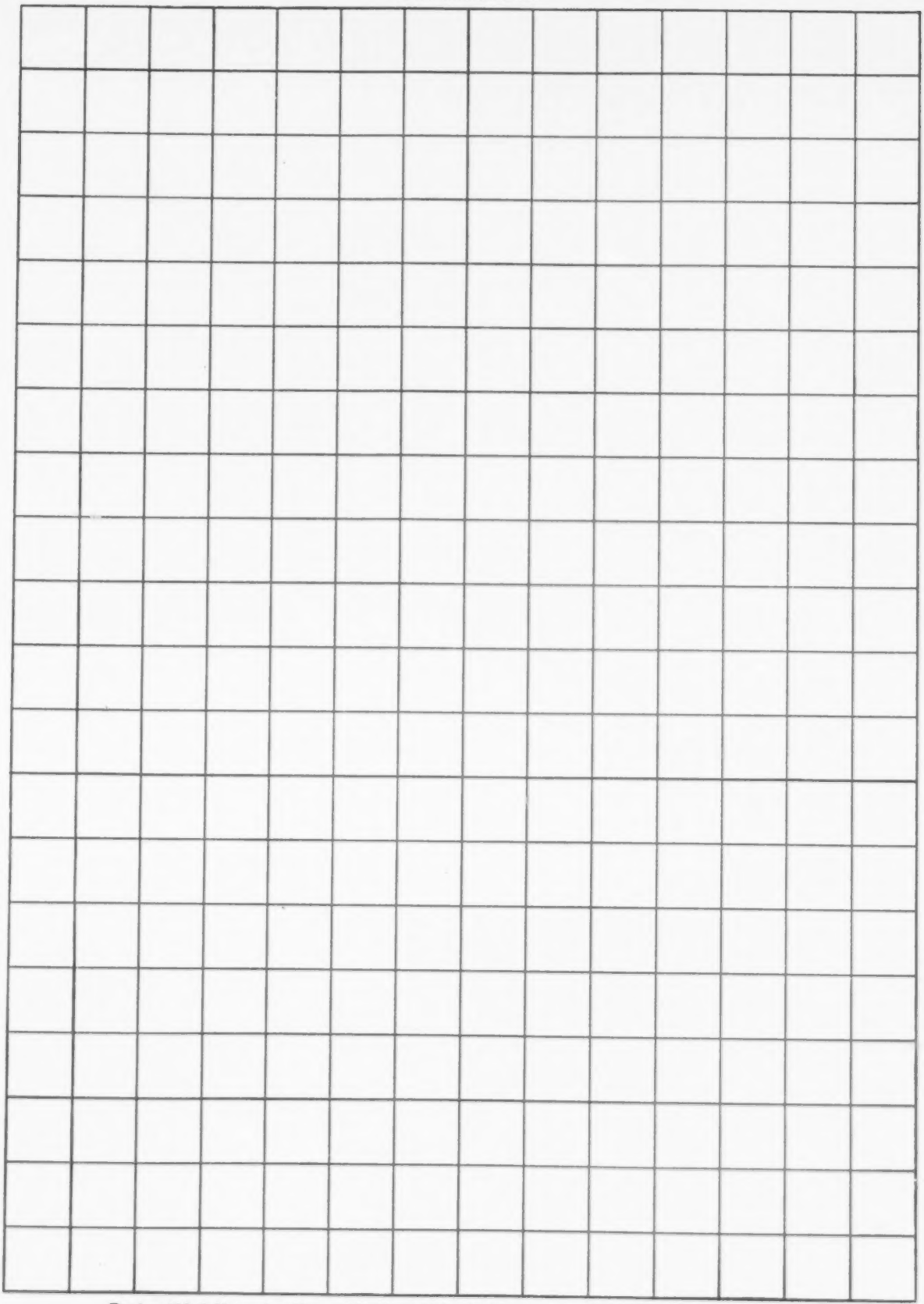


1 Division/Inch



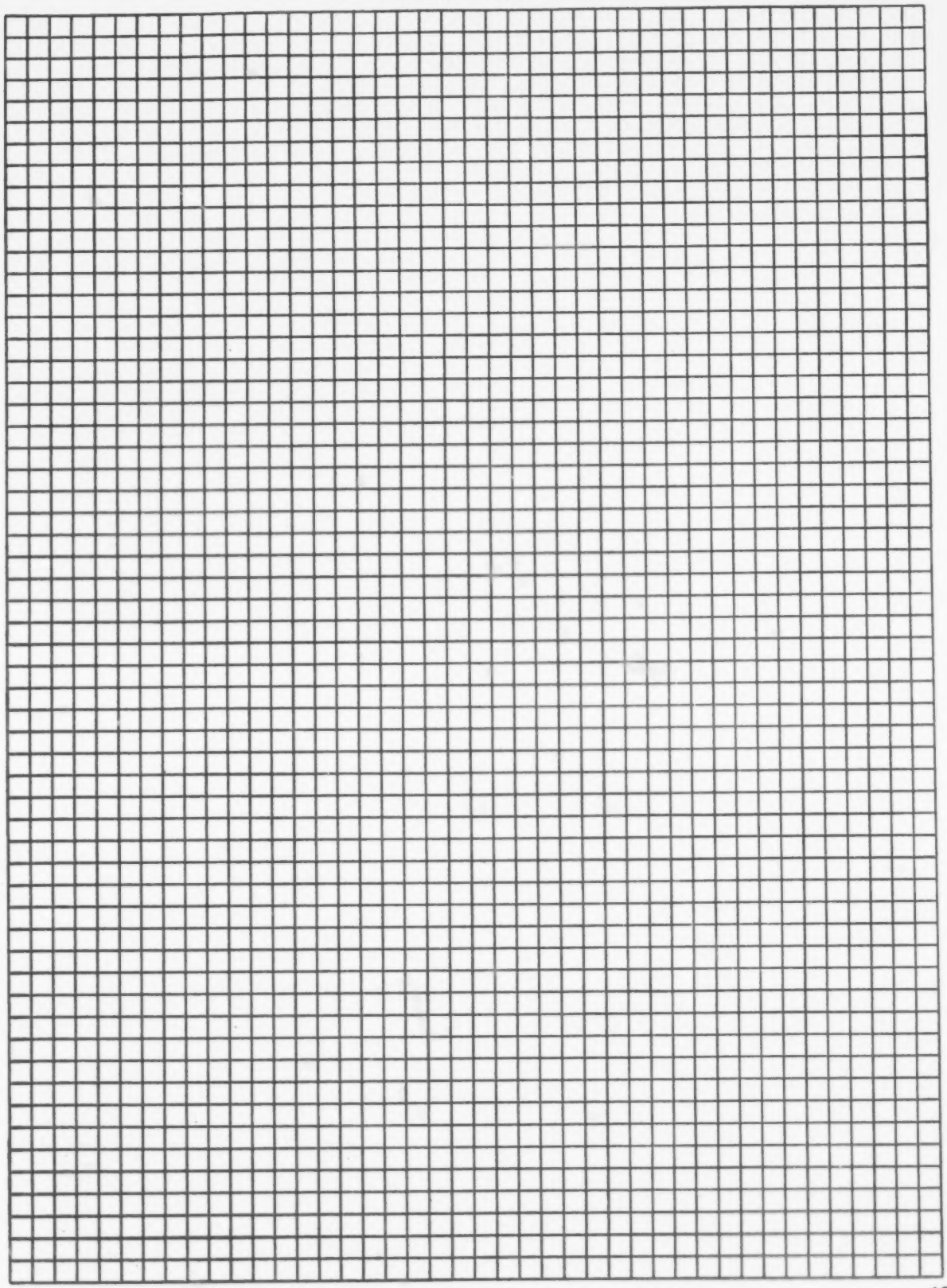
HPBooks—GRAPH PAPER From Your COPIER

2 Divisions/Inch



HPBooks—GRAPH PAPER From Your COPIER

6 Divisions/Inch



HPBooks—GRAPH PAPER From Your COPIER

IF SHIRTS ARE
$12.50 SALES ARE
DOWN 10%

IF SHIRTS ARE
MORE THAN $12.50
SALES ARE DOWN 90%

IF SHIRTS ARE
LESS THAN $12.50
SALES ARE NORMAL

BUSINESS
IS BOOMING!

SALES ARE UP
75% IF YOUR SHIRTS
ARE $10.00

SALES ARE UP
50% IF YOUR SHIRTS
ARE MORE THAN $10.00

WEATHER
IS BAD!

SALES ARE DOWN
50% IF YOU ARE INSIDE

SALES ARE DOWN
95% IF YOU ARE OUTSIDE

SALES DOWN 10%

SENIOR CITIZEN TRIP

SALES ARE UP
20% IF YOUR SHIRTS
ARE LESS THAN $11.00

SALES ARE DOWN
30% IF YOUR SHIRTS
ARE $11.00 OR MORE

SALES UP 40%

SALE

IF YOUR SHIRTS ARE
$10.00 YOU SELL 20%
OF YOUR REMAINING
STOCK
(ROUND TO THE NEAREST
WHOLE NUMBER)

IF YOUR SHIRTS ARE MORE
THAN $10.00 YOU SELL
5% OF YOUR REMAINING
STOCK

SALES
UP
30%

SCHOOLS
ON
FIELDTRIPS!

SALES ARE UP
10% IF YOUR SHIRTS
ARE LESS THAN $13.00

SALES ARE DOWN
80% IF YOUR SHIRTS
ARE $13.00 OR MORE

SALES DOWN 50%

NICE
WEATHER

AND MOST PEOPLE
ARE OUTSIDE

SALES ARE UP
15% IF YOU ARE OUTSIDE

SALES ARE DOWN
60% IF YOU ARE INSIDE

SALES DOWN 45%

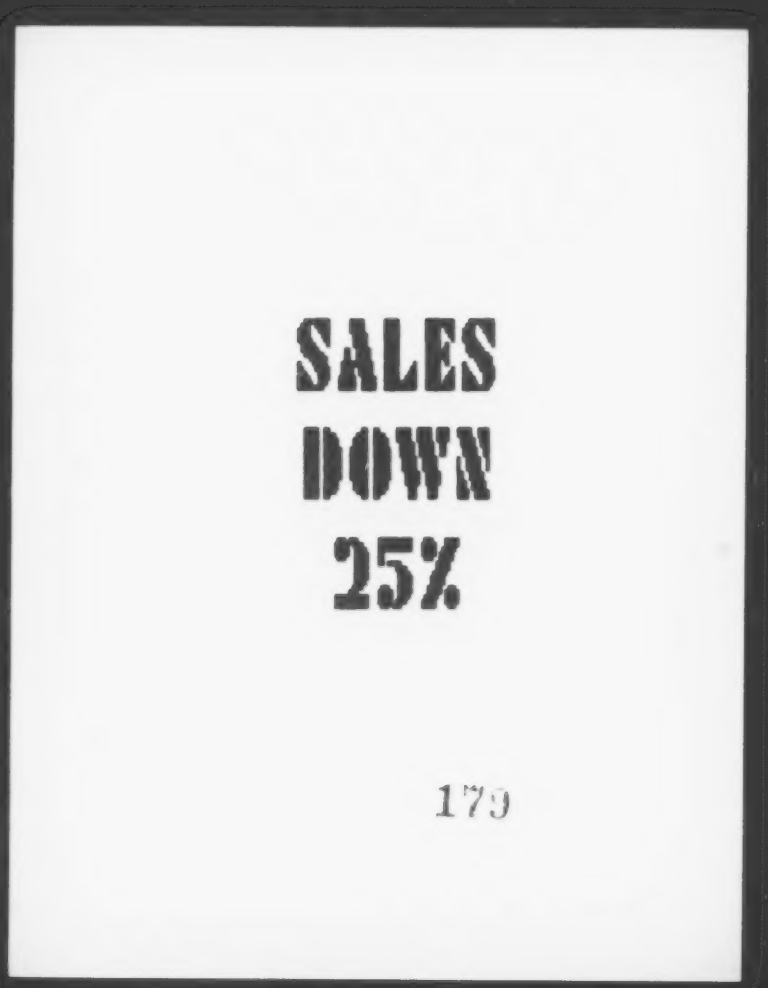
STORM..
NATIONAL
DISASTER
DECLARED BY
GOVERNOR

NO SALES TODAY

177

BUSINESS AS USUAL

178


SALES
DOWN
25%

GREAT WEATHER!

SALES ARE UP
80% IF YOU ARE OUTSIDE

SALES ARE UP
10% IF YOU ARE INSIDE

SPECIAL ORDER

150 SHIRTS
SOLD

CONVENTION IN TOWN

SALES ARE UP 100%

SCHOOLS
ON
FIELDTRIPS!

SALES ARE UP
80% IF YOUR SHIRTS
ARE LESS THAN $12.00

SALES ARE UP
30% IF YOUR SHIRTS
ARE $12.00 OR MORE

WEATHER
IS GREAT!

SALES ARE UP
10% IF YOU ARE INSIDE

SALES ARE UP
25% IF YOU ARE OUTSIDE

STORM TODAY

SALES ARE DOWN
30% IF YOU ARE INSIDE

SALES ARE DOWN
90% IF YOU ARE OUTSIDE

NO SALES

IF YOU ARE OUTSIDE

IF YOU ARE INSIDE
SALES ARE DOWN 70%

SALES
UP
25%

SALES
DOWN
30%

SALES
DOWN
15%

SALES
UP
15%

190

ADVERTISEMENT

PAYS OFF

SALES UP

5%

SALES
UP
20%

19

NO

SALES

IF YOUR SHIRTS ARE

$15.00

IF YOUR SHIRTS ARE
LESS THAN $15.00
SALES ARE UP 35%

SALES UP 45%

194

TOURIST SEASON

ALL SALES ARE UP 25%

SALES DOWN 40%

SALES DOWN 35%

SALES
UP
5%

SALES DOWN 20%

199

BULLMARKET
BULLMARKET
BULLMARKET
BULLMARKET
BULLMARKET
BULLMARKET
BULLMARKET

SALES
UP
10%

SALES

ARE UP

33 1/3 %

IF YOU ARE OUTSIDE

SALES

ARE DOWN

66 2/3 %

IF YOU ARE INSIDE

202

SALES
UP
50%

CONVENTION IN TOWN

SALES ARE UP
60% IF YOUR SHIRTS
ARE LESS THAN $12.00

SALES ARE DOWN
50% IF YOUR SHIRTS
ARE $12.00 OR MORE

SALES
UP
35%